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(54) **MANAGED FILE BACKUP AND RESTORE AT REMOTE STORAGE LOCATIONS THROUGH MULTI-SERVICES GATEWAY AT USER PREMISES**

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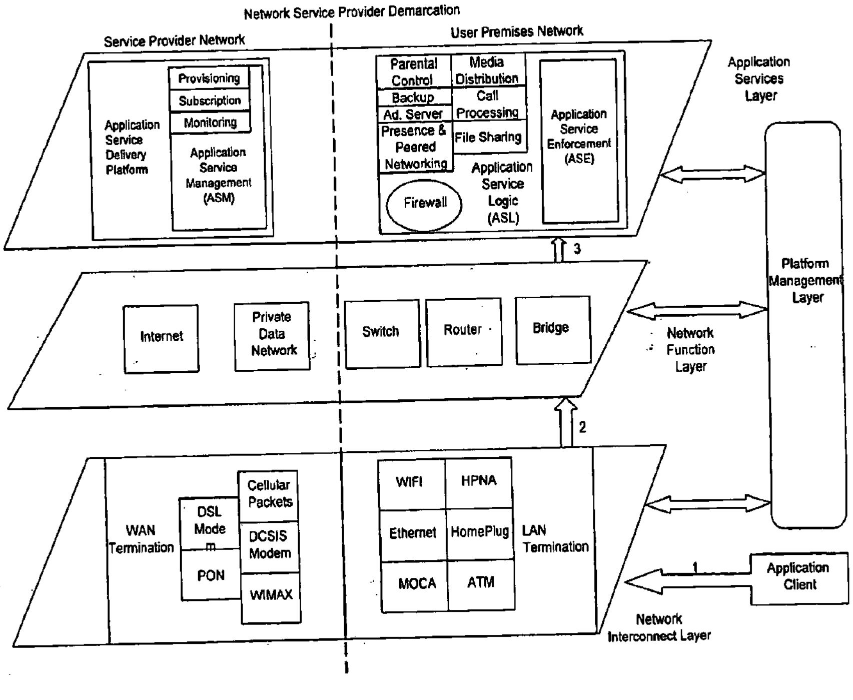
(57) **ABSTRACT**

The disclosed examples of a system for providing and managing backup and restore services of one or more endpoint devices comprise at least one gateway device at a user premises and a service management center. The gateway device has a first interface for enabling bi-directional communications with one or more of the endpoint devices associated with the gateway device, a second interface for enabling bi-directional communications for the one or more endpoint devices via a wide area network, and for enabling at least some bidirectional communications with at least one storage area external to the user premises via the wide area network. The gateway device also has a processor configured to manage backups and restores of data between the one or more of the endpoint devices and the at least one storage area. The service management center is external to the user premises and communicates with the gateway device via the wide area network, and controls access by the gateway device to the at least one storage area.



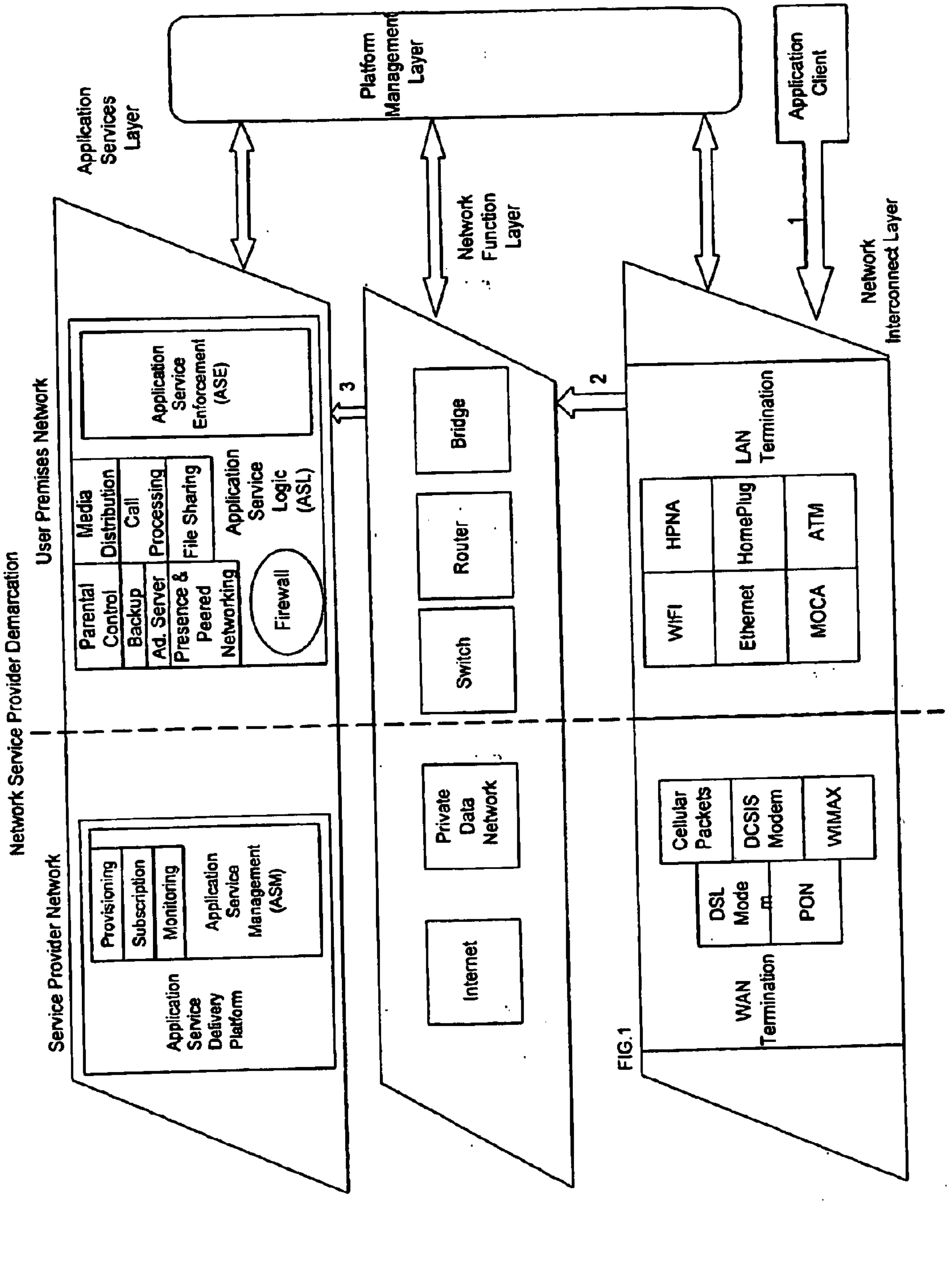

Application Services Layer
Platform Management Layer
Application Client
Network Function Layer
Network Interconnect Layer
1
2
3
Network Service Provider Demarcation
Service Provider Network
User Premises Network
Application Service Delivery Platform
Provisioning
Subscription
Monitoring
Application Service Management (ASM)
Parental Control
Backup
Ad. Server
Presence & Peered Networking
Media Distribution
Call Processing
File Sharing
Application Service Logic (ASL)
Firewall
Application Service Enforcement (ASE)
Internet
Private Data Network
Switch
Router
Bridge
WAN Termination
DSL Modem
PON
Cellular Packets
DCSIS Modem
WIMAX
LAN Termination
WIFI
HPNA
Ethernet
HomePlug
MOCA
ATM

FIG.1

FIG. 2

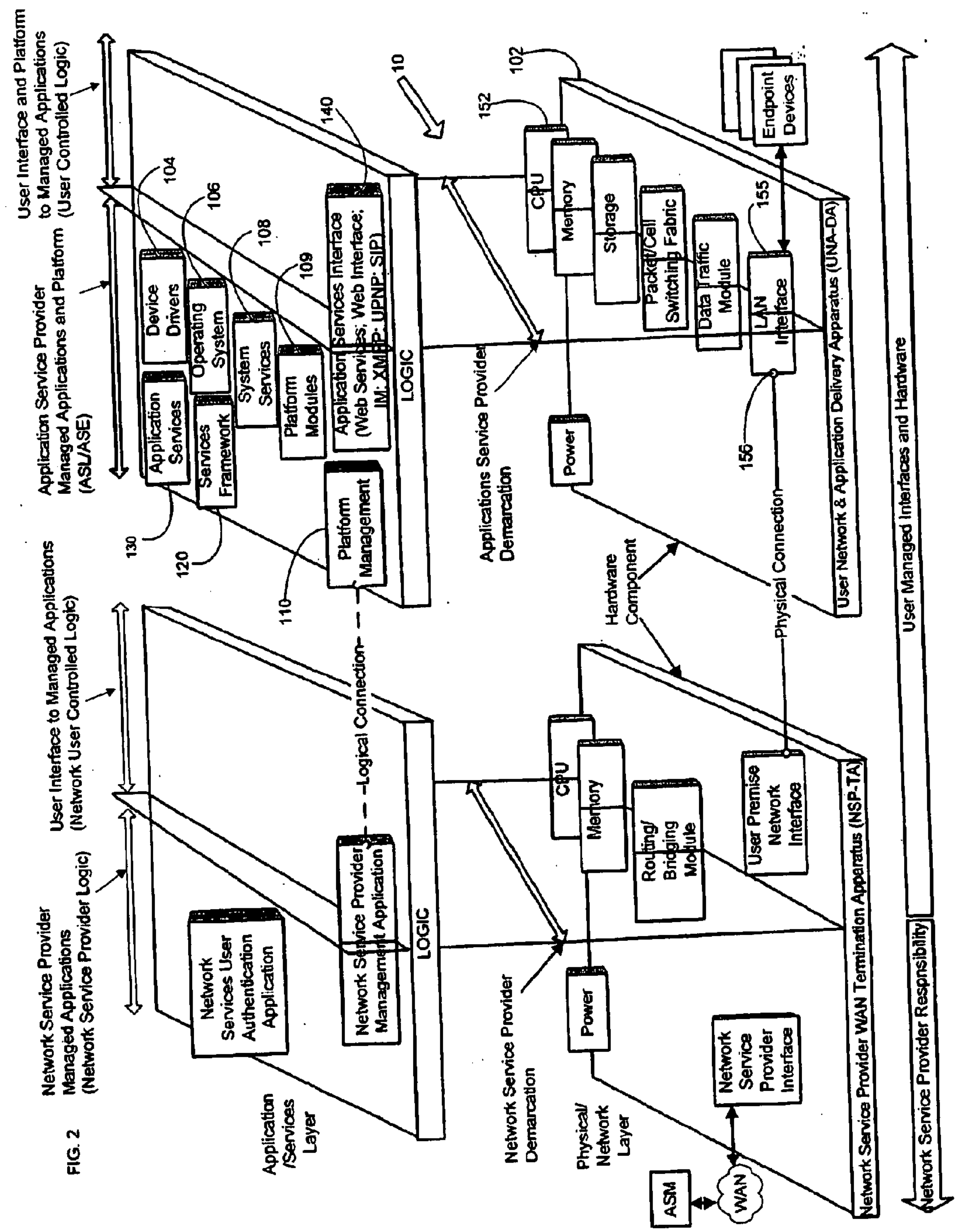

Network Service Provider Managed Applications (Network Service Provider Logic)
User Interface to Managed Applications (Network User Controlled Logic)
Application Service Provider Managed Applications and Platform (ASL/ASE)
User Interface and Platform to Managed Applications (User Controlled Logic)
Application /Services Layer
Network Services User Authentication Application
Network Service Provider Management Application
Logical Connection
LOGIC
Platform Management
110
120
130
Application Services
Services Framework
Device Drivers
Operating System
System Services
Platform Modules
Application Services Interface (Web Services; Web Interface; IM: XMPP: UPNP: SIP)
104
106
108
109
140
10
Network Service Provider Demarcation
Applications Service Provider Demarcation
Physical/ Network Layer
Power
CPU
Memory
Routing/ Bridging Module
User Premise Network Interface
Network Service Provider Interface
ASM
WAN
Hardware Component
Physical Connection
156
Storage
Packet/Cell Switching Fabric
Data Traffic Module
LAN Interface
155
152
102
Endpoint Devices
Network Service Provider WAN Termination Apparatus (NSP-TA)
User Network & Application Delivery Apparatus (UNA-DA)
Network Service Provider Responsibility
User Managed Interfaces and Hardware

FIG. 3A

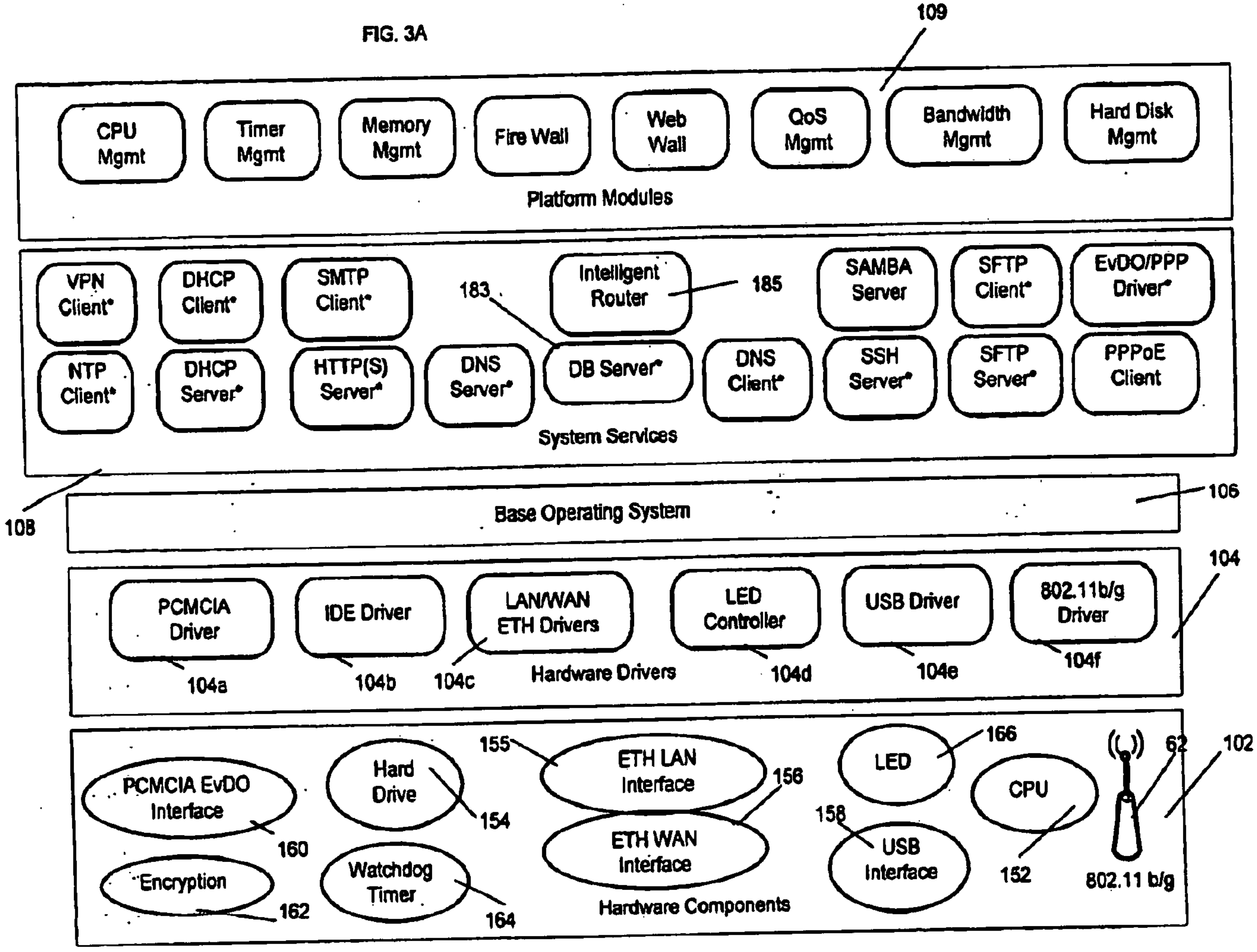
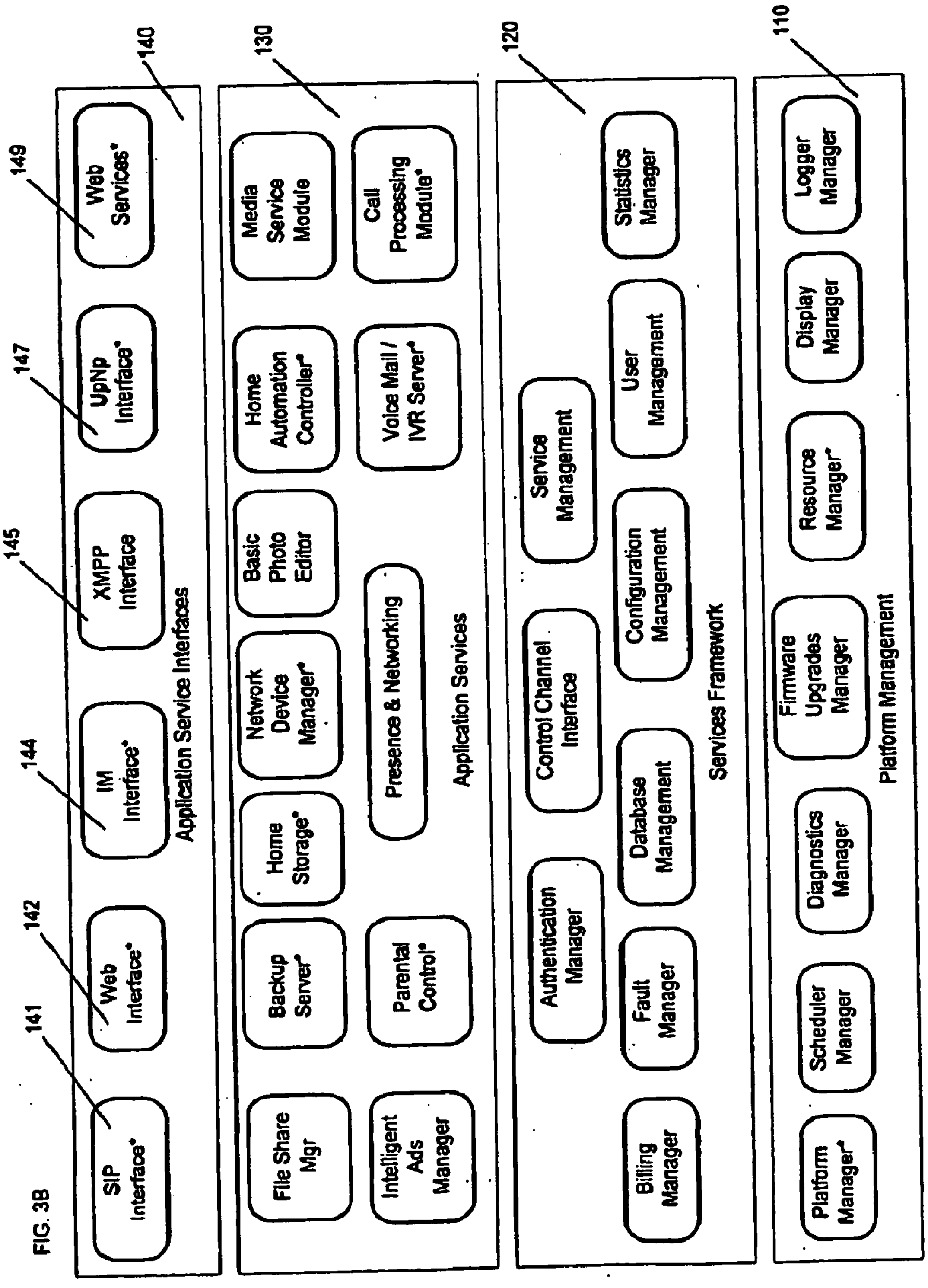
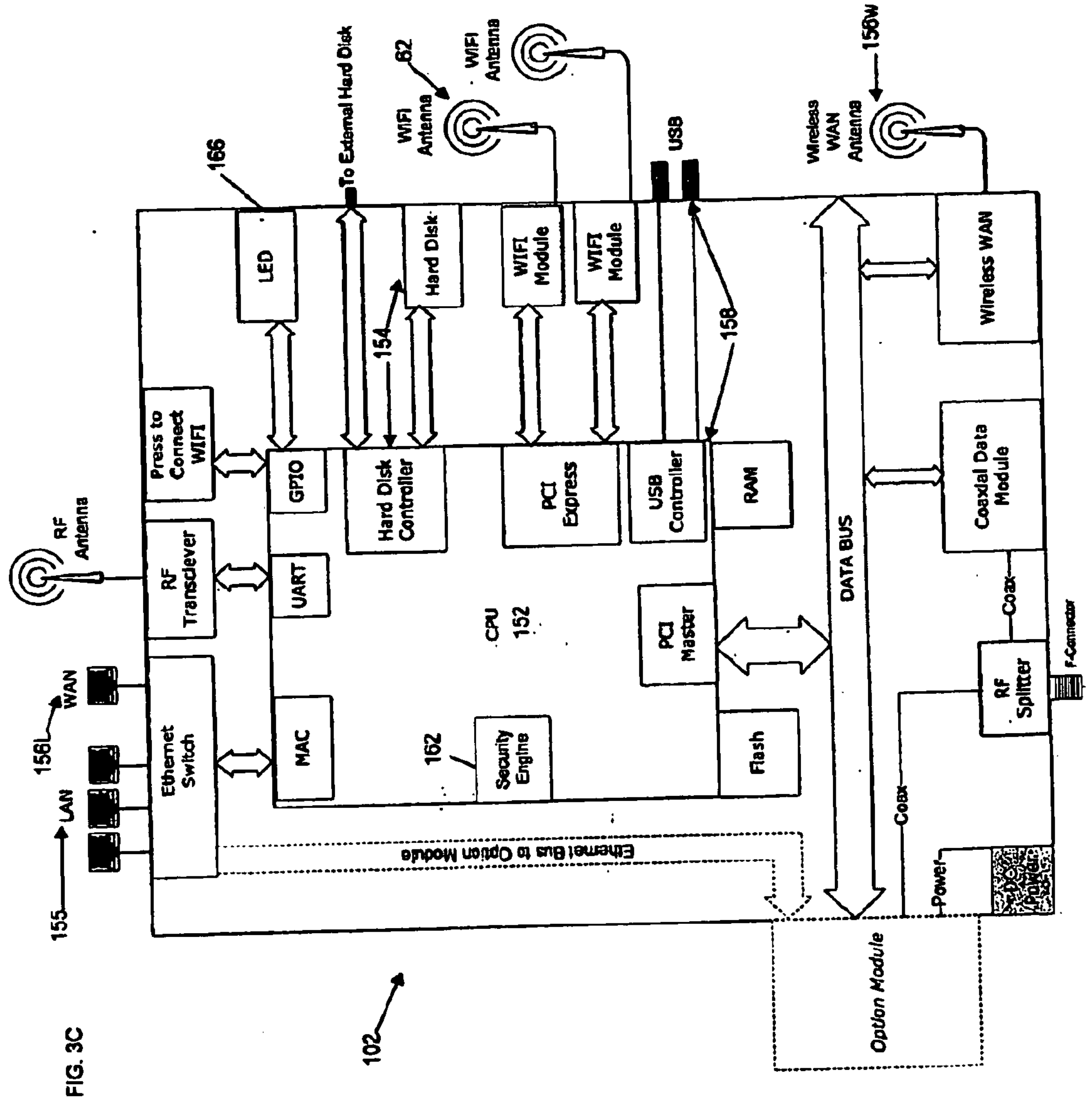

109
CPU Mgmt
Timer Mgmt
Memory Mgmt
Fire Wall
Web Wall
QoS Mgmt
Bandwidth Mgmt
Hard Disk Mgmt
Platform Modules
VPN Client*
DHCP Client*
SMTP Client*
183
Intelligent Router
185
SAMBA Server
SFTP Client*
EvDO/PPP Driver*
NTP Client*
DHCP Server*
HTTP(S) Server*
DNS Server*
DB Server*
DNS Client*
SSH Server*
SFTP Server*
PPPoE Client
System Services
108
Base Operating System
106
104
PCMCIA Driver
IDE Driver
LAN/WAN ETH Drivers
LED Controller
USB Driver
802.11b/g Driver
104a
104b
104c
Hardware Drivers
104d
104e
104f
155
166
62
102
PCMCIA EvDO Interface
Hard Drive
ETH LAN Interface
156
LED
CPU
154
158
160
ETH WAN Interface
USB Interface
Encryption
Watchdog Timer
152
802.11 b/g
162
164
Hardware Components

FIG. 3B


140
141
SIP Interface*
142
Web Interface*
144
IM Interface*
145
XMPP Interface
147
UpNp Interface*
149
Web Services*
Application Service Interfaces
130
File Share Mgr
Backup Server*
Home Storage*
Network Device Manager*
Basic Photo Editor
Home Automation Controller*
Media Service Module
Intelligent Ads Manager
Parental Control*
Presence & Networking
Voice Mail / IVR Server*
Call Processing Module*
Application Services
120
Authentication Manager
Control Channel Interface
Service Management
Billing Manager
Fault Manager
Database Management
Configuration Management
User Management
Statistics Manager
Services Framework
110
Platform Manager*
Scheduler Manager
Diagnostics Manager
Firmware Upgrades Manager
Resource Manager*
Display Manager
Logger Manager
Platform Management



166
To External Hard Disk
WIFI Antenna
62
WIFI Antenna
USB
Wireless WAN Antenna
156W
RF Antenna
LED
Hard Disk
154
WIFI Module
WIFI Module
158
Wireless WAN
Press to Connect WIFI
GPIO
Hard Disk Controller
PCI Express
USB Controller
RAM
Coaxial Data Module
RF Transciever
UART
CPU 152
PCI Master
DATA BUS
Coax
F-Connector
RF Splitter
WAN
156L
LAN
155
Ethernet Switch
MAC
162
Security Engine
Flash
Coax
Ethernet Bus to Option Module
Power
Power
Option Module
102

FIG. 3C

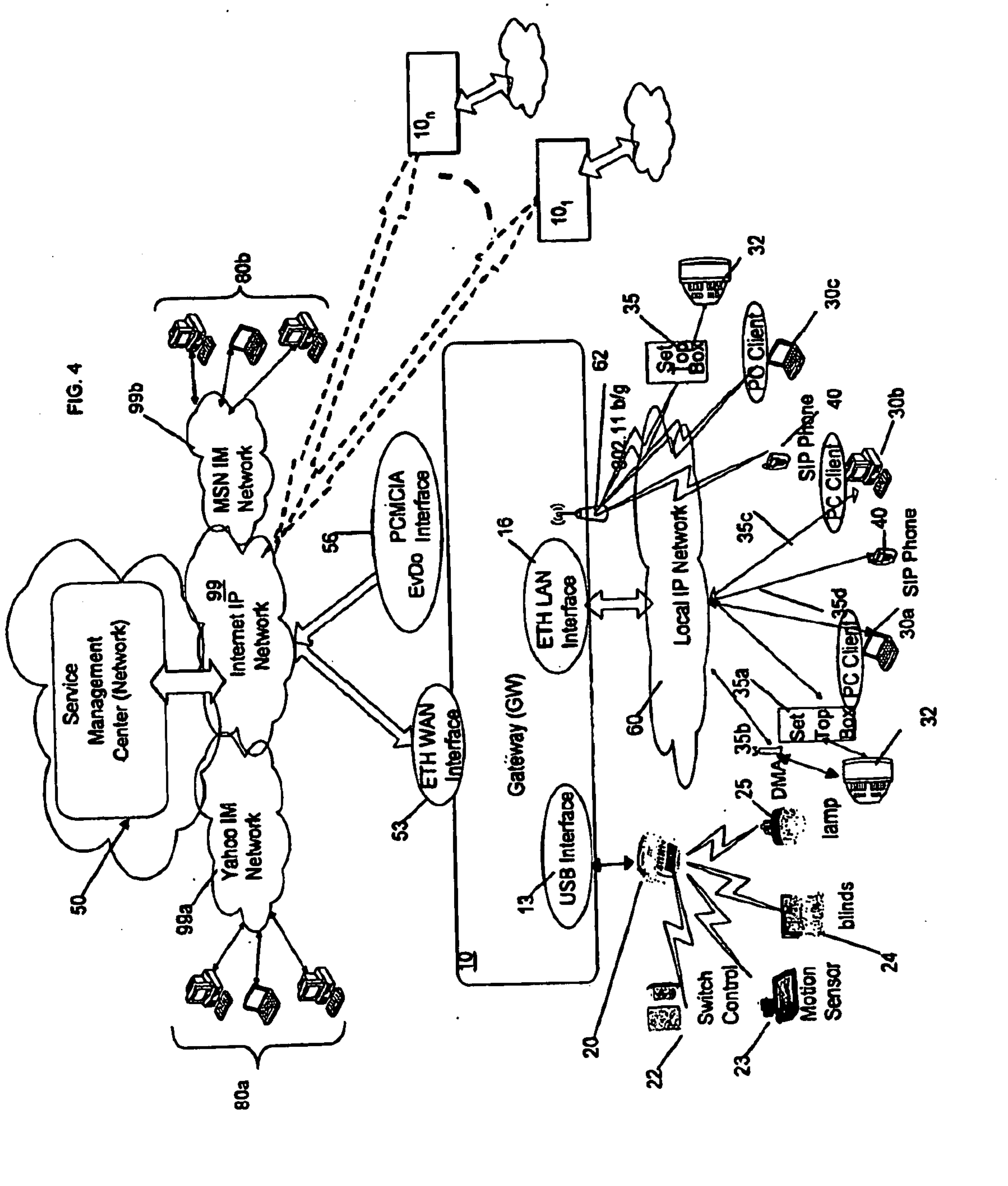


FIG. 4

Service Management Center (Network)
50
Internet IP Network
99
Yahoo IM Network
99a
MSN IM Network
99b
80a
80b
10_n
10_1
PCMCIA EvDo Interface
56
ETH WAN Interface
53
Gateway (GW)
10
ETH LAN Interface
16
USB Interface
13
802.11 b/g
62
Local IP Network
60
Set Top Box
35
32
PC Client
30c
SIP Phone
40
PC Client
30b
35c
40
SIP Phone
35d
PC Client
30a
35a
Set Top Box
35b
DMA
32
25
lamp
blinds
24
20
Switch Control
22
Motion Sensor
23

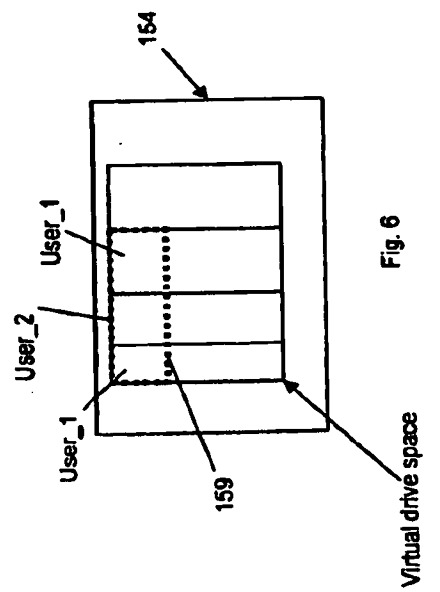


Fig. 6

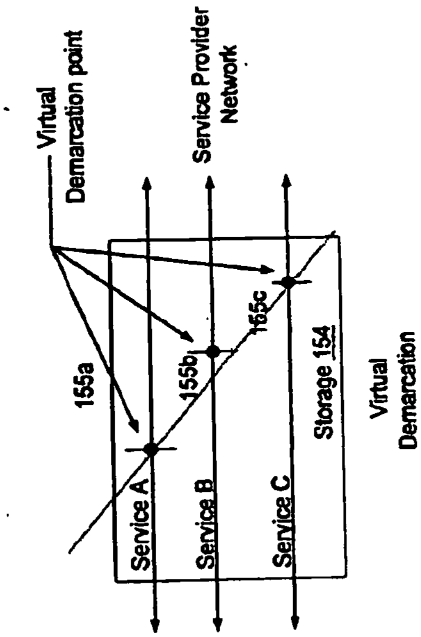


FIG. 5B

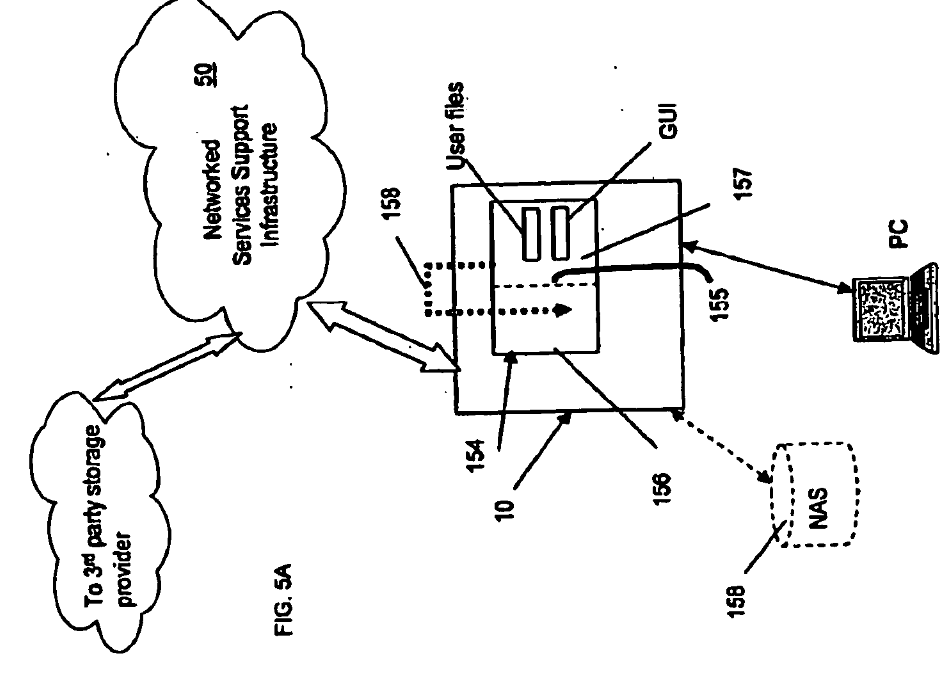

Networked Services Support Infrastructure 50
To 3rd party storage provider
User files
GUI
158
157
155
154
10
156
PC
NAS
158

FIG. 5A

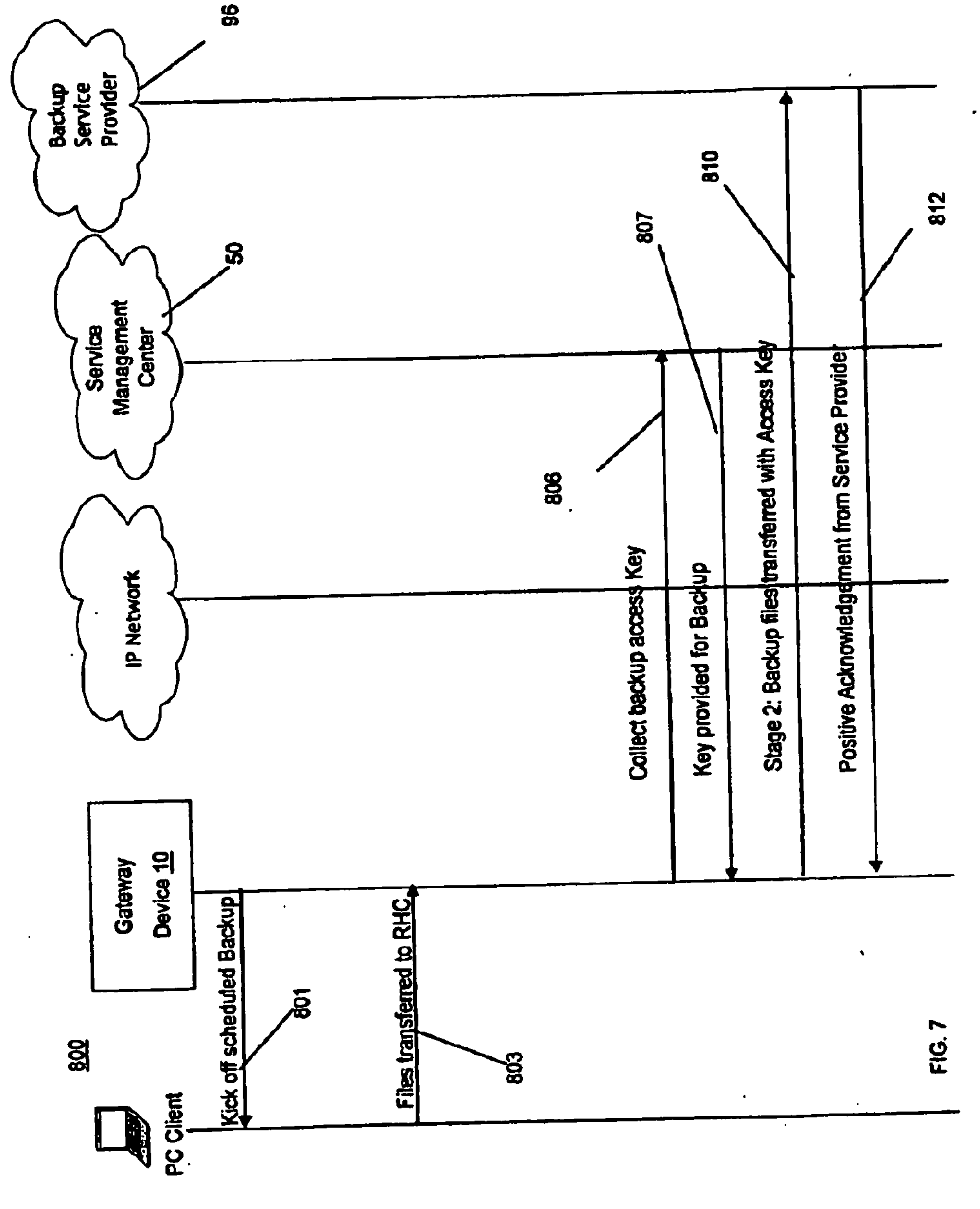

800
PC Client
Gateway Device 10
IP Network
Service Management Center
50
Backup Service Provider
96
Kick off scheduled Backup
801
Files transferred to RHC
803
Collect backup access Key
806
Key provided for Backup
807
Stage 2: Backup files transferred with Access Key
810
Positive Acknowledgement from Service Provide
812

FIG. 7

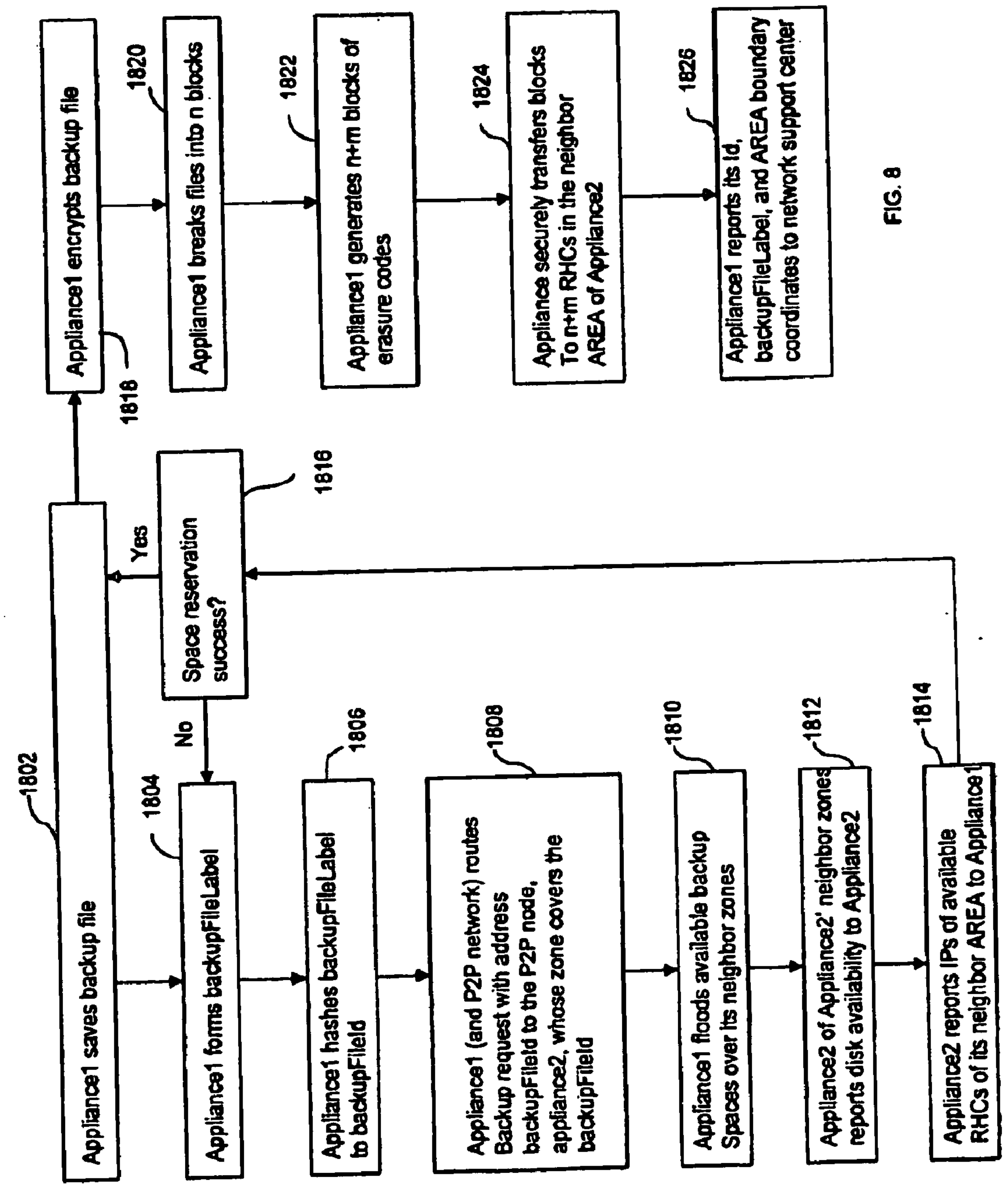

1802
Appliance1 saves backup file
1804
Appliance1 forms backupFileLabel
1806
Appliance1 hashes backupFileLabel to backupFileId
1808
Appliance1 (and P2P network) routes Backup request with address backupFileId to the P2P node, appliance2, whose zone covers the backupFileId
1810
Appliance1 floods available backup Spaces over its neighbor zones
1812
Appliance2 of Appliance2' neighbor zones reports disk availability to Appliance2
1814
Appliance2 reports IPs of available RHCs of its neighbor AREA to Appliance1
1816
Space reservation success?
No
Yes
1818
Appliance1 encrypts backup file
1820
Appliance1 breaks files into n blocks
1822
Appliance1 generates n+m blocks of erasure codes
1824
Appliance securely transfers blocks To n+m RHCs in the neighbor AREA of Appliance2
1826
Appliance1 reports its Id, backupFileLabel, and AREA boundary coordinates to network support center

FIG. 8

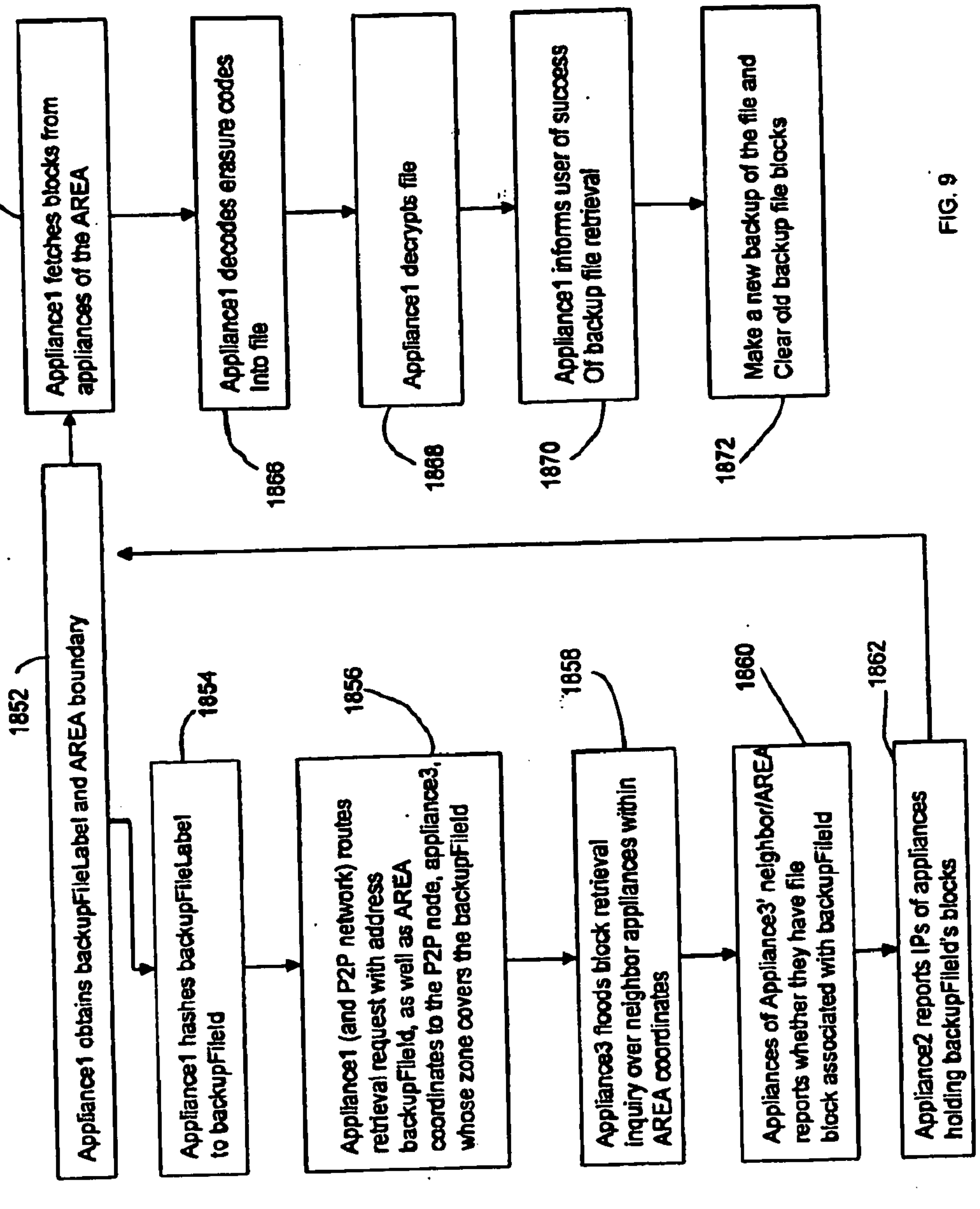

Appliance1 obtains backupFileLabel and AREA boundary
1852
Appliance1 hashes backupFileLabel to backupFileId
1854
Appliance1 (and P2P network) routes retrieval request with address backupFileId, as well as AREA coordinates to the P2P node, appliance3, whose zone covers the backupFileId
1856
Appliance3 floods block retrieval inquiry over neighbor appliances within AREA coordinates
1858
Appliances of Appliance3' neighbor/AREA reports whether they have file block associated with backupFileId
1860
Appliance2 reports IPs of appliances holding backupFileId's blocks
1862
Appliance1 fetches blocks from appliances of the AREA
1864
Appliance1 decodes erasure codes Into file
1866
Appliance1 decrypts file
1868
Appliance1 informs user of success Of backup file retrieval
1870
Make a new backup of the file and Clear old backup file blocks
1872

FIG. 9

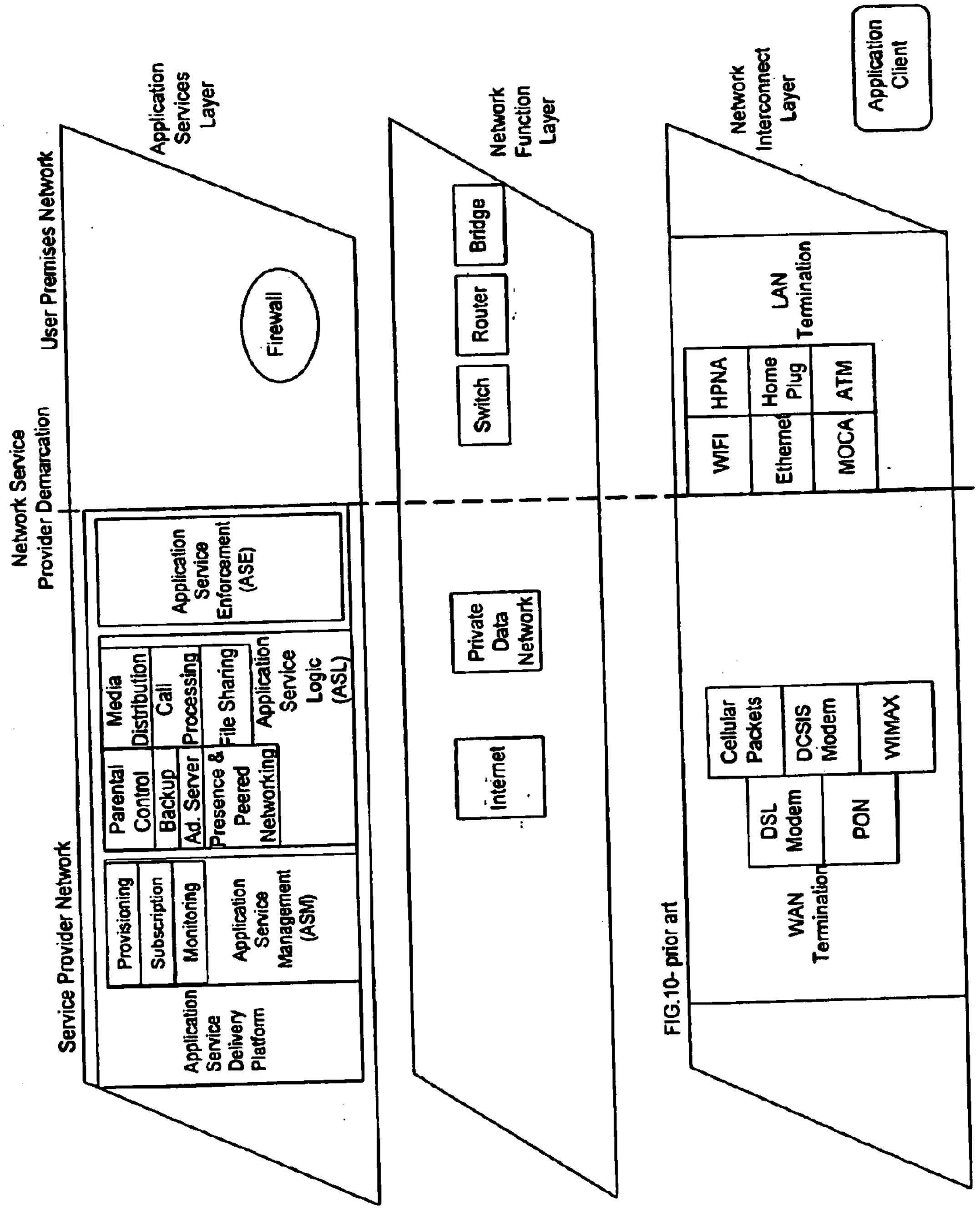


FIG.10- prior art

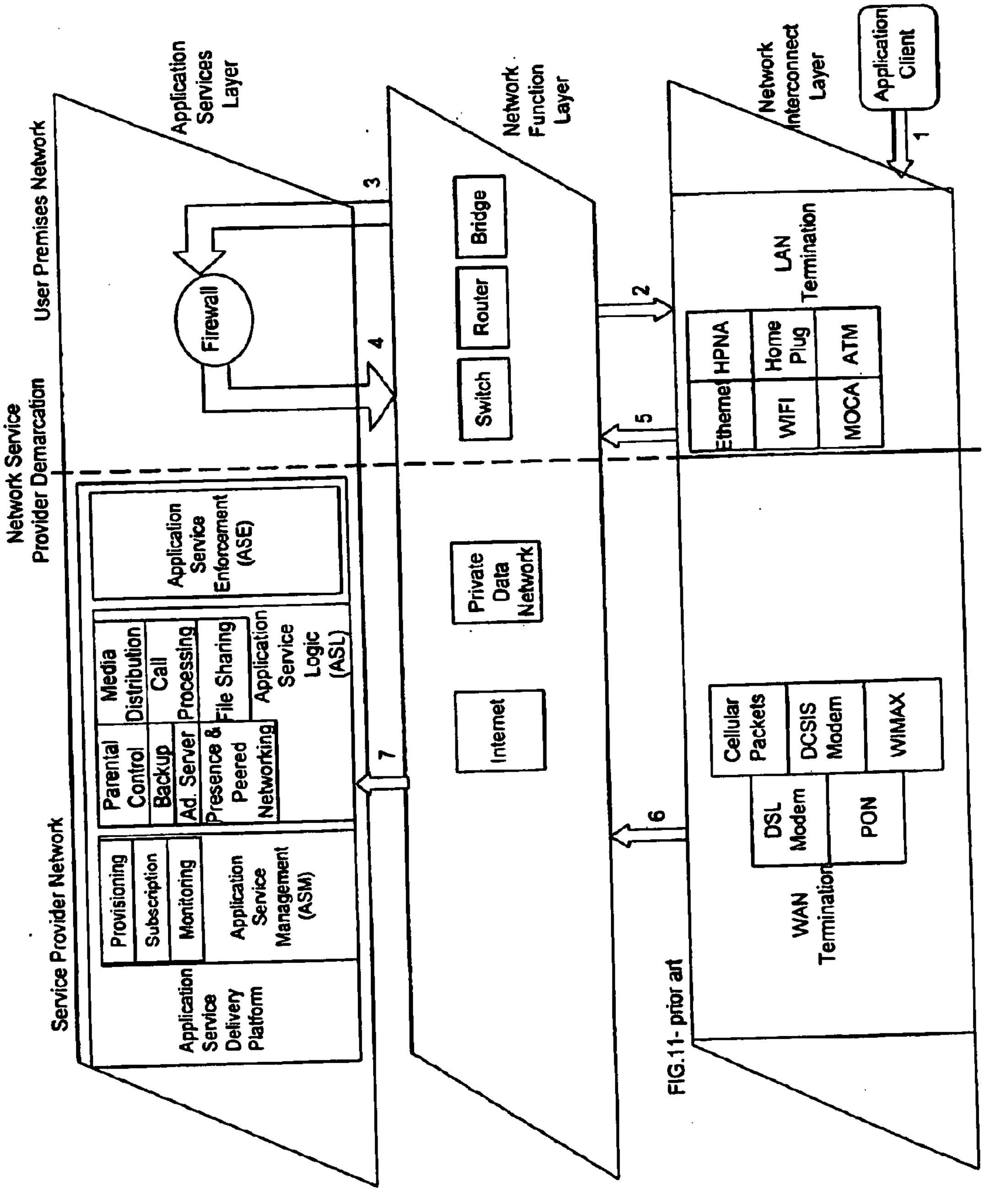


FIG.11- prior art

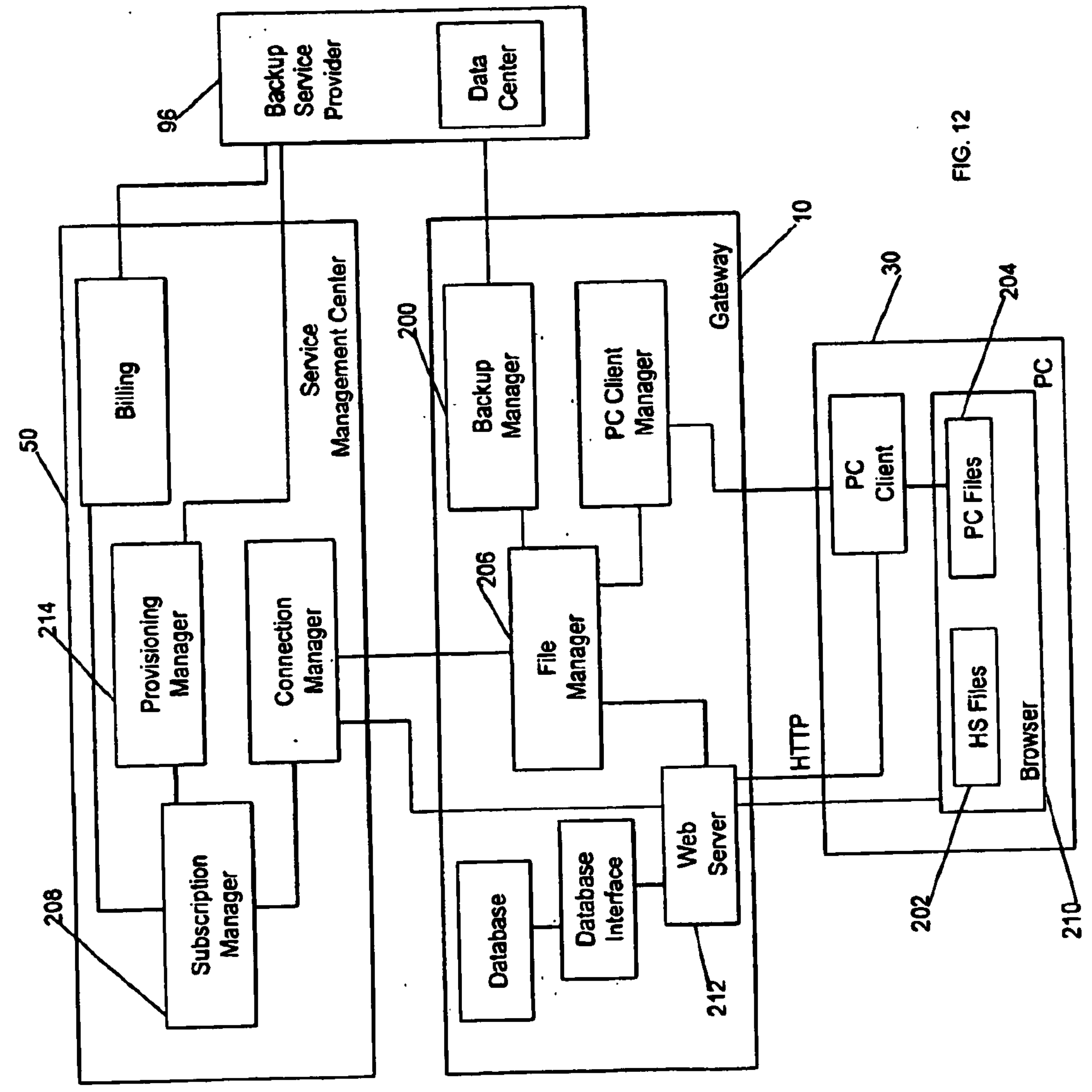

96
Backup Service Provider
Data Center
50
Service Management Center
Billing
214
Provisioning Manager
Connection Manager
208
Subscription Manager
10
Gateway
200
Backup Manager
PC Client Manager
206
File Manager
Web Server
212
Database Interface
Database
HTTP
30
PC
PC Client
204
PC Files
HS Files
Browser
202
210

FIG. 12

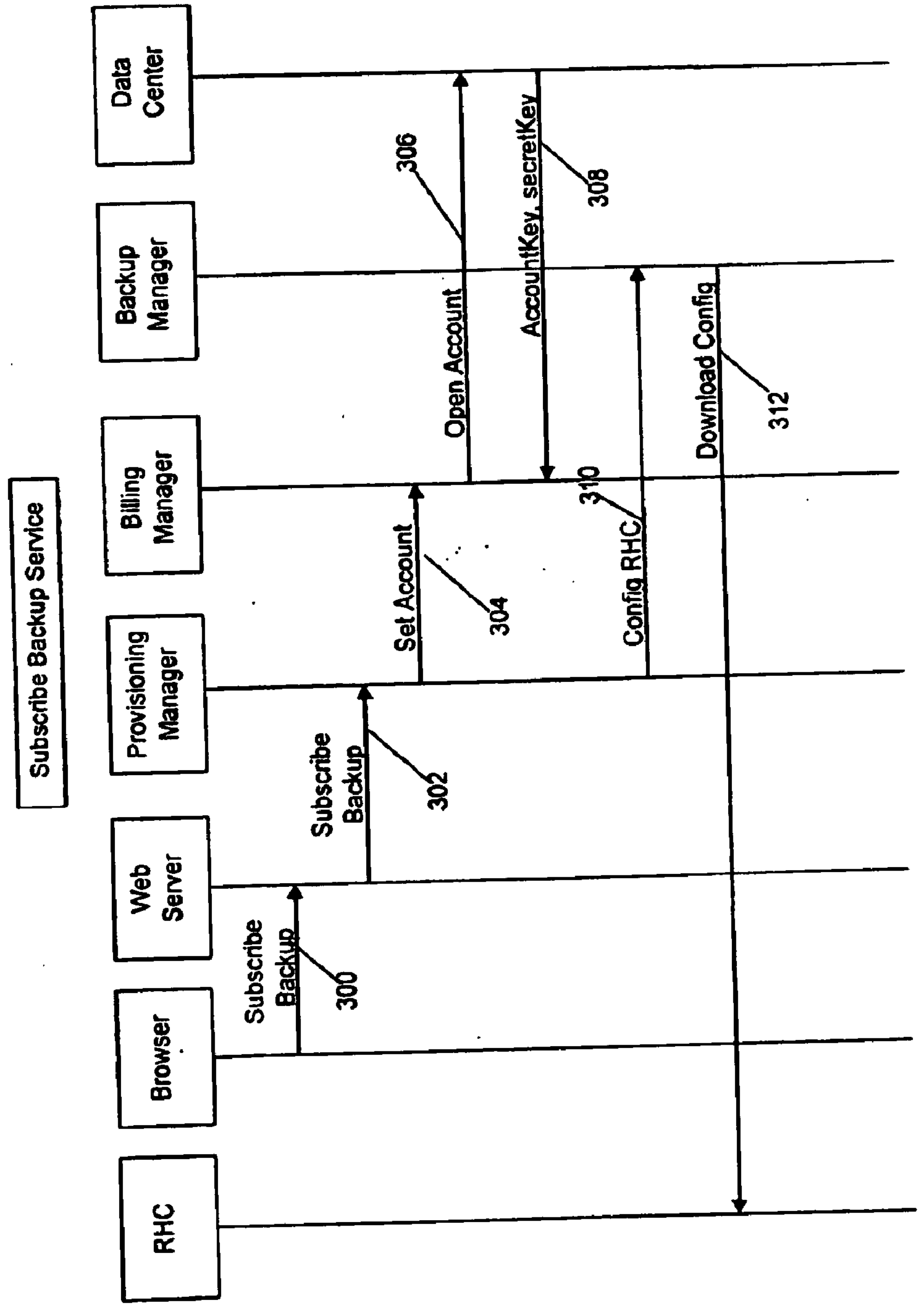

Subscribe Backup Service
RHC
Browser
Web Server
Provisioning Manager
Billing Manager
Backup Manager
Data Center
Subscribe Backup
300
Subscribe Backup
302
Set Account
304
Open Account
306
AccountKey, secretKey
308
Config RHC
310
Download Config
312

FIG. 13

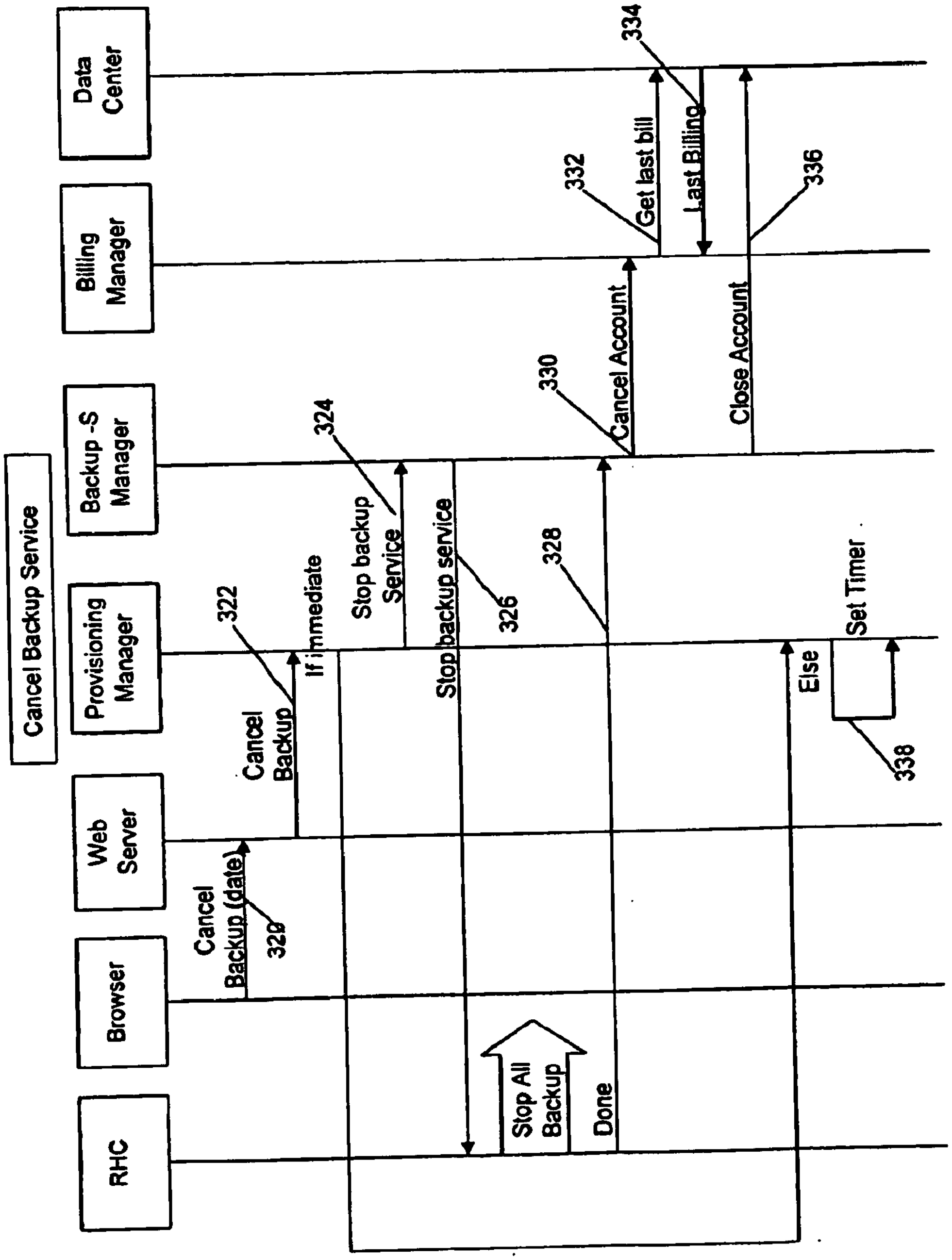

Cancel Backup Service
RHC
Browser
Web Server
Provisioning Manager
Backup -S Manager
Billing Manager
Data Center
Cancel Backup (date)
320
Cancel Backup
322
If immediate
Stop backup Service
324
Stop backup service
326
Stop All Backup
Done
328
Cancel Account
330
Get last bill
332
Last Billing
334
Close Account
336
Else
Set Timer
338

FIG. 14

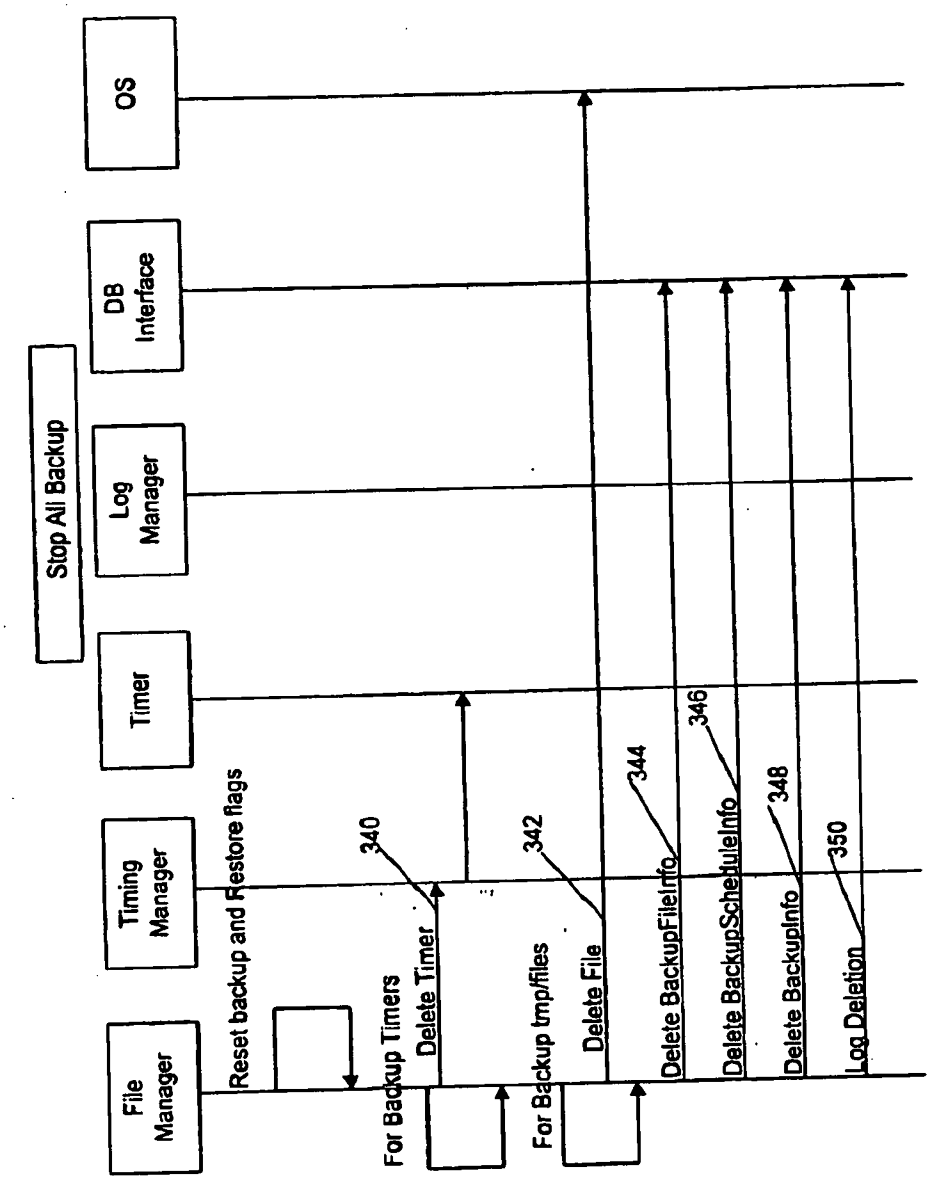

Stop All Backup
File Manager
Timing Manager
Timer
Log Manager
DB Interface
OS
Reset backup and Restore flags
For Backup Timers
Delete Timer
340
For Backup tmp/files
Delete File
342
Delete BackupFileInfo
344
Delete BackupScheduleInfo
346
Delete BackupInfo
348
Log Deletion
350

FIG. 15

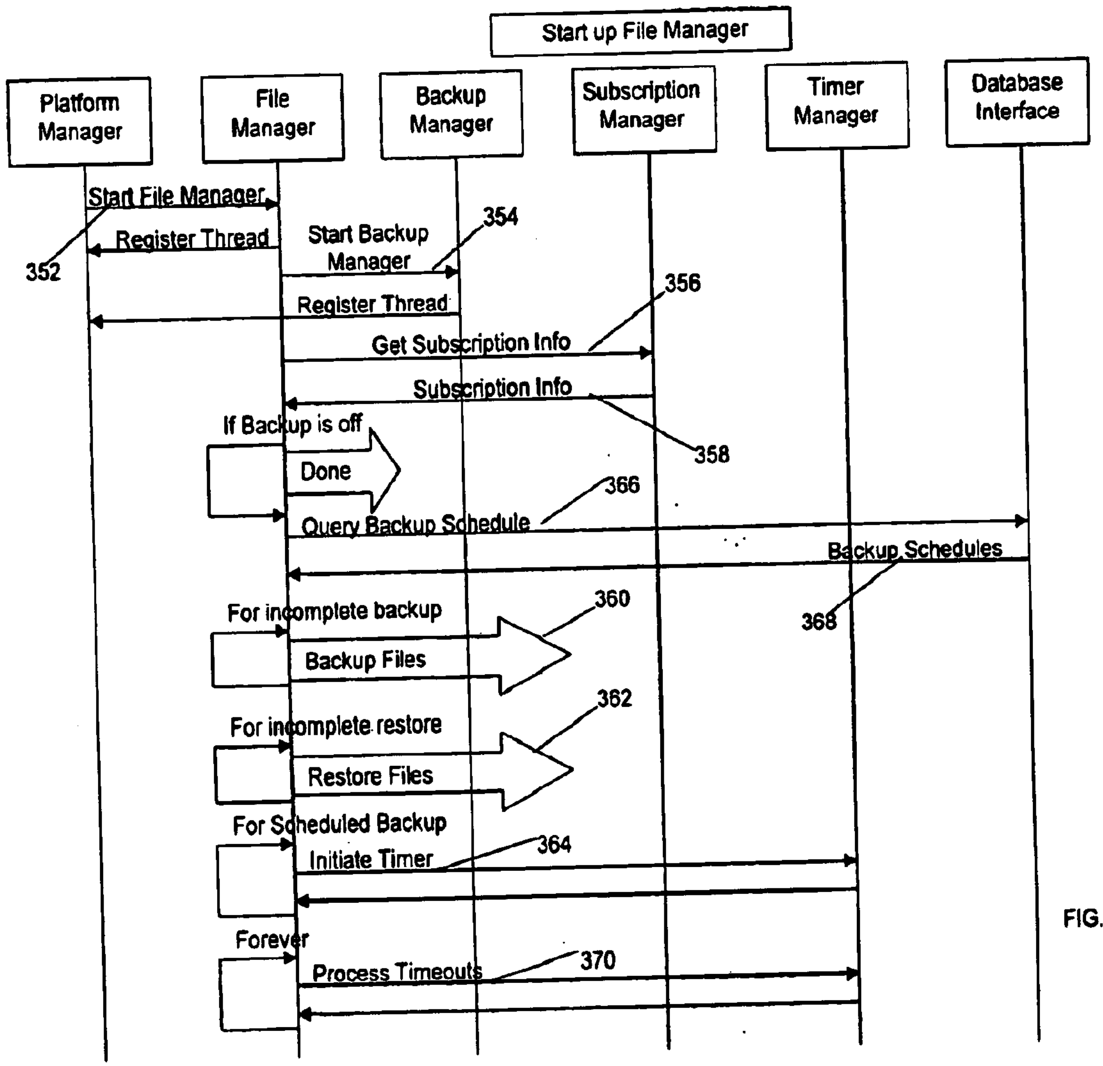

Start up File Manager
Platform Manager
File Manager
Backup Manager
Subscription Manager
Timer Manager
Database Interface
Start File Manager
352
Register Thread
Start Backup Manager
354
Register Thread
Get Subscription Info
356
Subscription Info
358
If Backup is off
Done
Query Backup Schedule
366
Backup Schedules
368
For incomplete backup
Backup Files
360
For incomplete restore
Restore Files
362
For Scheduled Backup
Initiate Timer
364
Forever
Process Timeouts
370

FIG. 16

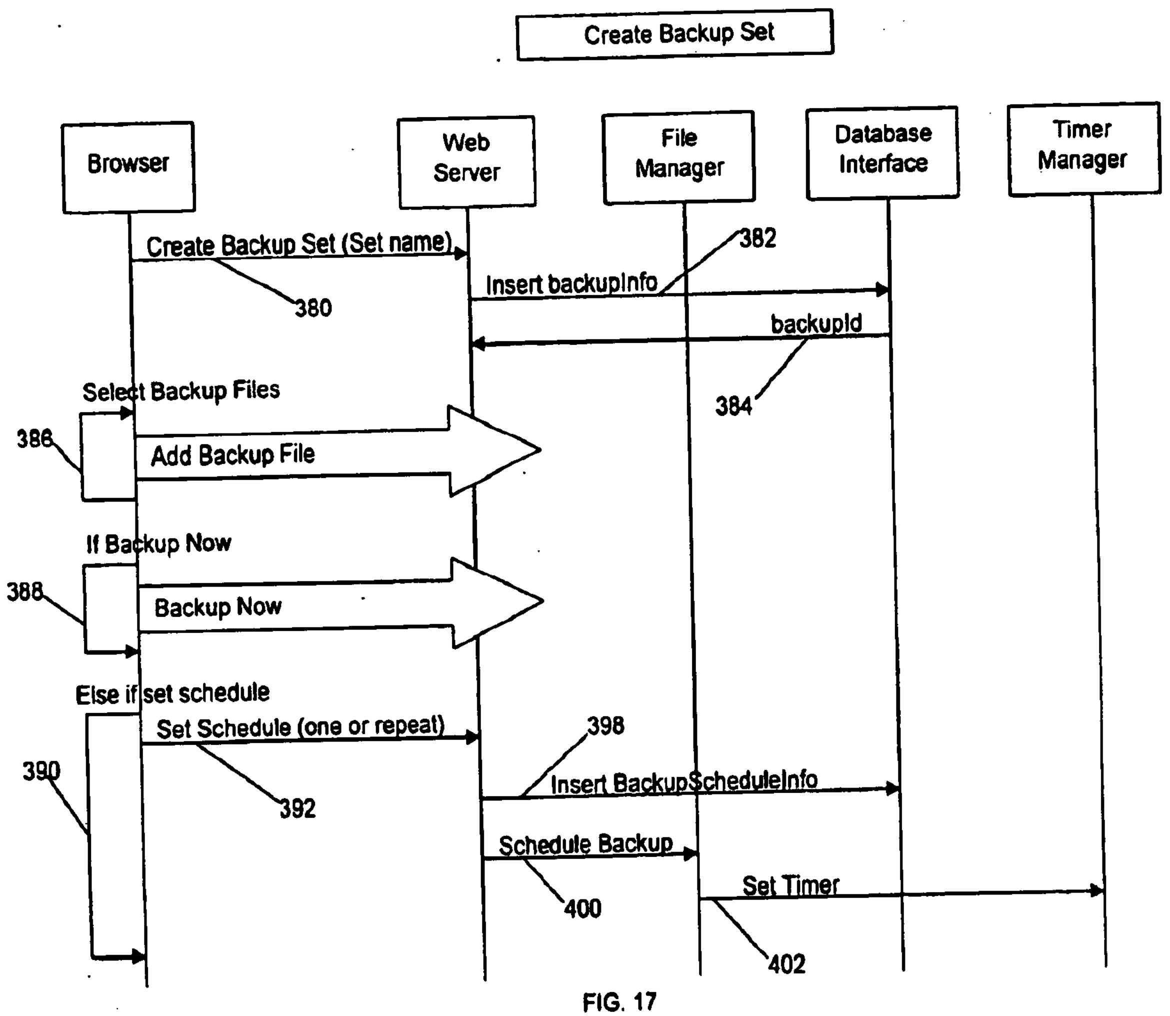

Create Backup Set
Browser
Web Server
File Manager
Database Interface
Timer Manager
Create Backup Set (Set name)
380
382
Insert backupInfo
backupId
384
Select Backup Files
386
Add Backup File
If Backup Now
388
Backup Now
Else if set schedule
Set Schedule (one or repeat)
390
392
398
Insert BackupScheduleInfo
Schedule Backup
400
Set Timer
402

FIG. 17

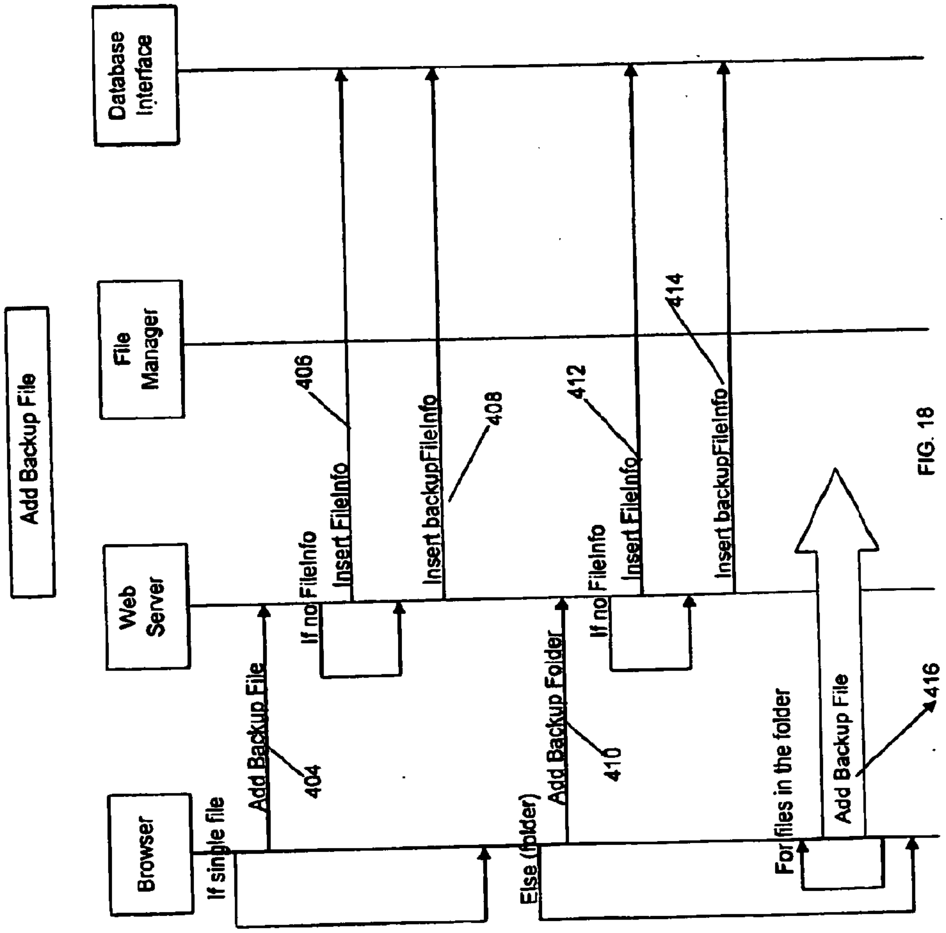

Add Backup File
Browser
Web Server
File Manager
Database Interface
If single file
Add Backup File
404
If no FileInfo
Insert FileInfo
406
Insert backupFileInfo
408
Else (folder)
Add Backup Folder
410
If no FileInfo
Insert FileInfo
412
Insert backupFileInfo
414
For files in the folder
Add Backup File
416

FIG. 18

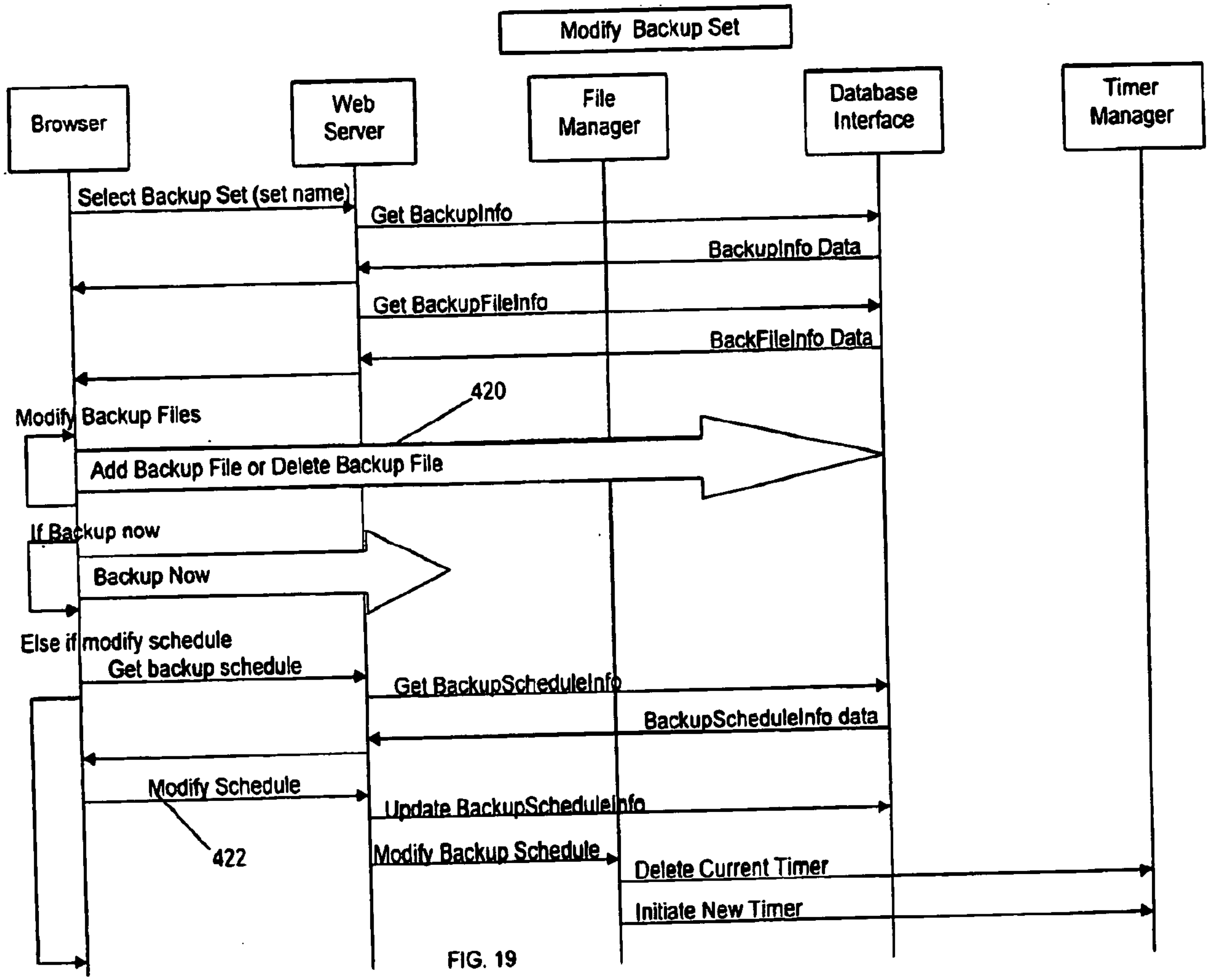

Modify Backup Set
Browser
Web Server
File Manager
Database Interface
Timer Manager
Select Backup Set (set name)
Get BackupInfo
BackupInfo Data
Get BackupFileInfo
BackFileInfo Data
420
Modify Backup Files
Add Backup File or Delete Backup File
If Backup now
Backup Now
Else if modify schedule
Get backup schedule
Get BackupScheduleInfo
BackupScheduleInfo data
Modify Schedule
Update BackupScheduleInfo
422
Modify Backup Schedule
Delete Current Timer
Initiate New Timer

FIG. 19

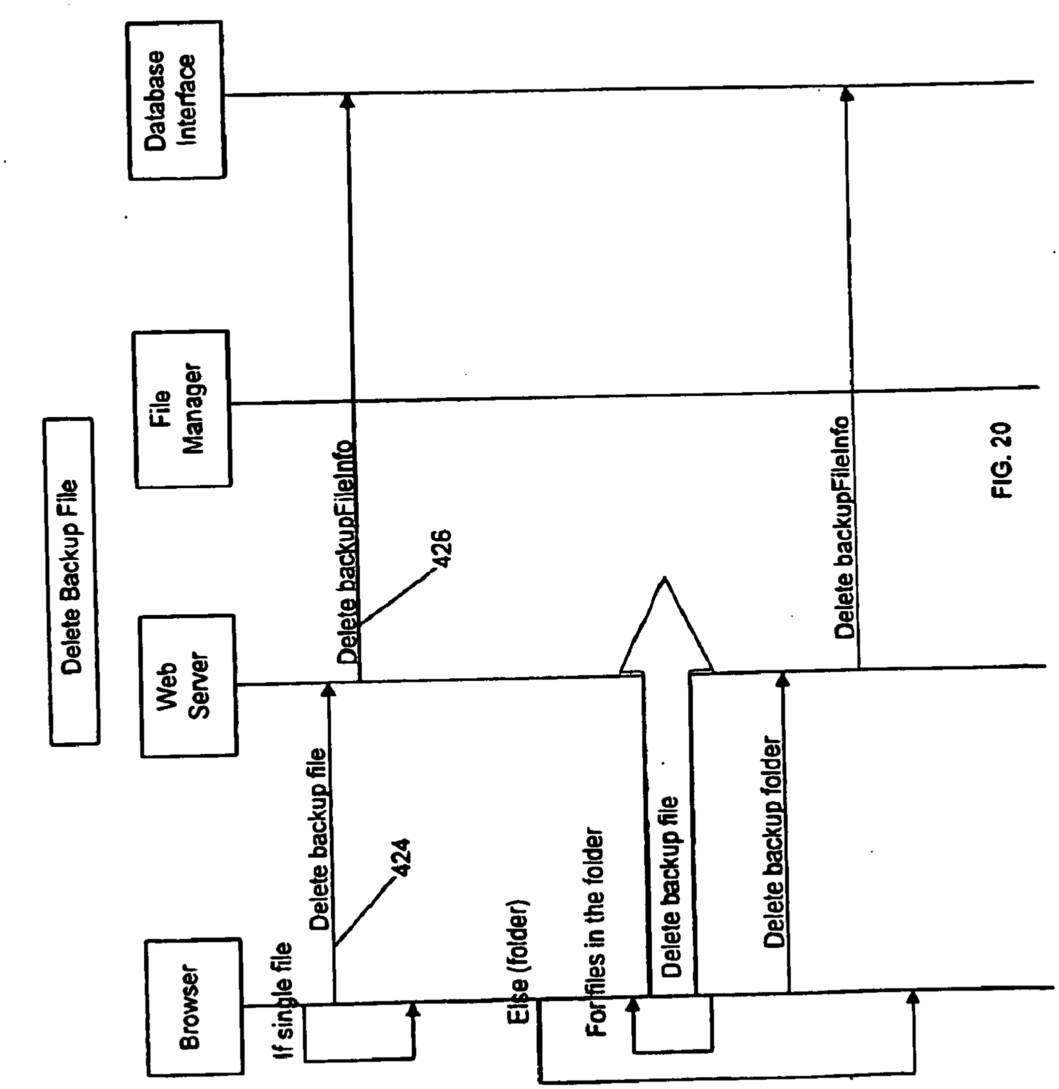

Delete Backup File
Browser
Web Server
File Manager
Database Interface
If single file
Delete backup file
424
Delete backupFileInfo
426
Else (folder)
For files in the folder
Delete backup file
Delete backup folder
Delete backupFileInfo

FIG. 20

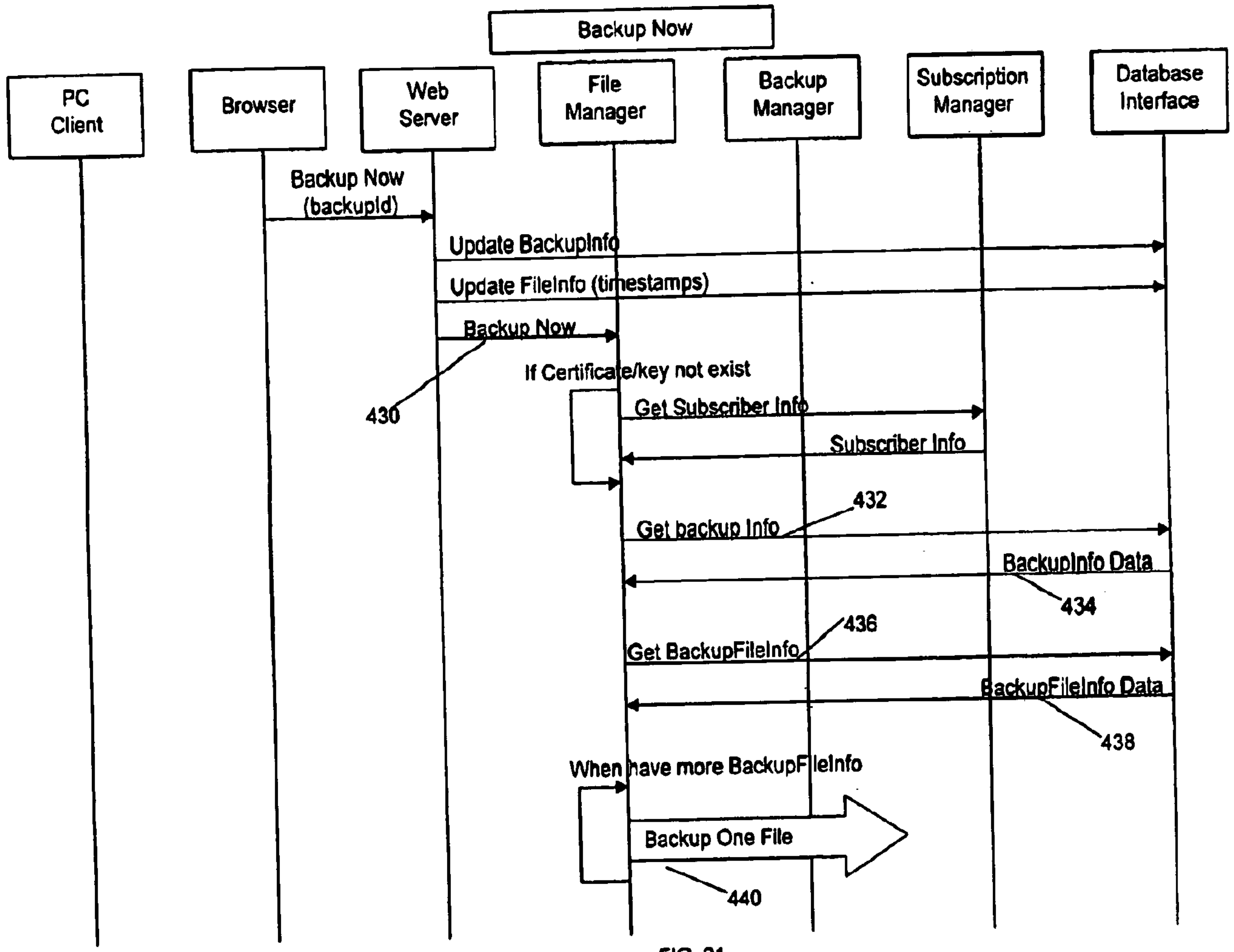

Backup Now
PC Client
Browser
Web Server
File Manager
Backup Manager
Subscription Manager
Database Interface
Backup Now (backupId)
Update BackupInfo
Update FileInfo (timestamps)
Backup Now
430
If Certificate/key not exist
Get Subscriber Info
Subscriber Info
432
Get backup Info
BackupInfo Data
434
436
Get BackupFileInfo
BackupFileInfo Data
438
When have more BackupFileInfo
Backup One File
440

FIG. 21

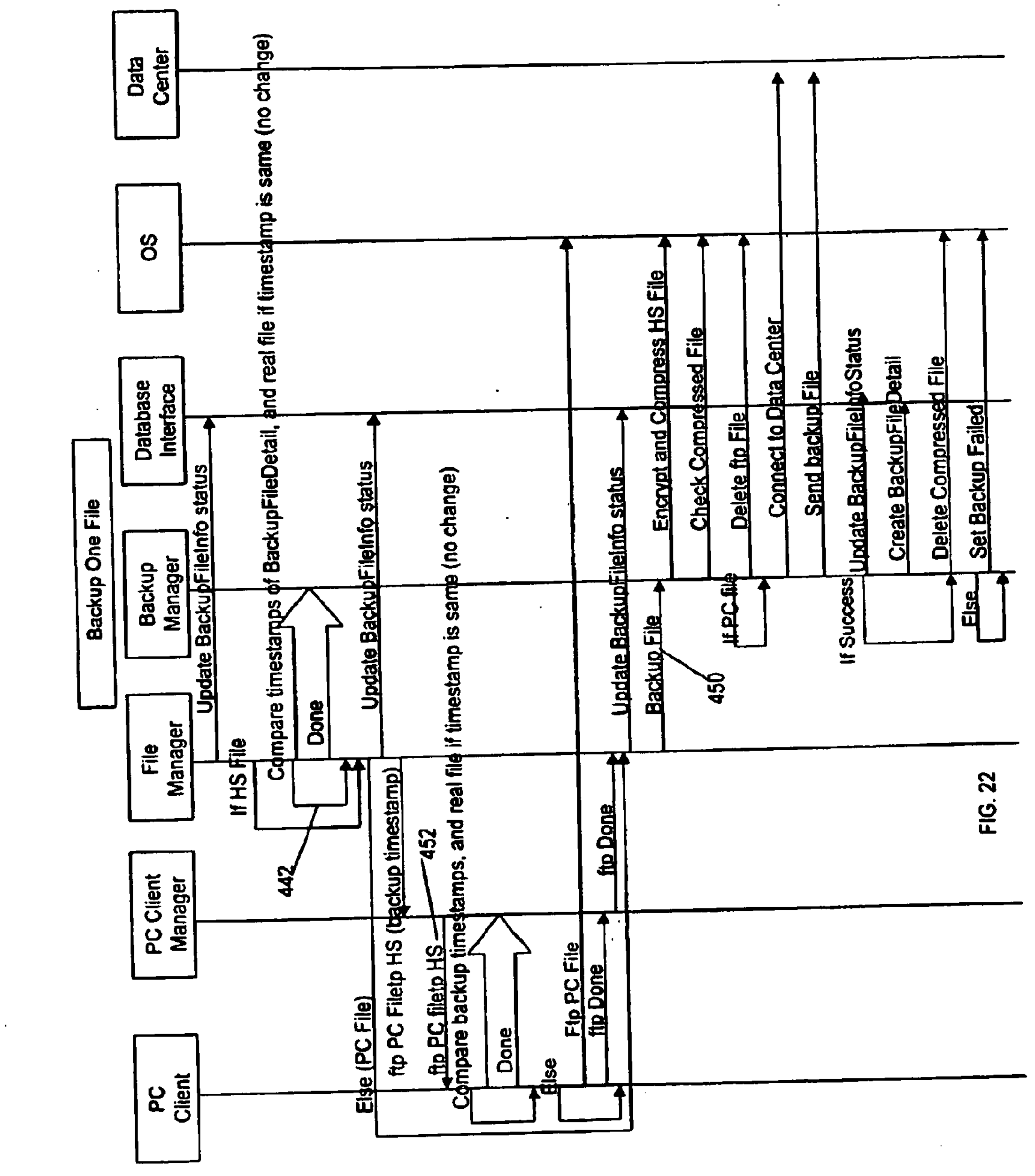

Backup One File
PC Client
PC Client Manager
File Manager
Backup Manager
Database Interface
OS
Data Center
If HS File
Update BackupFileInfo status
Compare timestamps of BackupFileDetail, and real file if timestamp is same (no change)
Done
Update BackupFileInfo status
442
Else (PC File)
ftp PC Filetp HS (backup timestamp)
452
ftp PC filetp HS
Compare backup timestamps, and real file if timestamp is same (no change)
Done
Else
Ftp PC File
ftp Done
ftp Done
Update BackupFileInfo status
Backup File
450
Encrypt and Compress HS File
Check Compressed File
If PC file
Delete ftp File
Connect to Data Center
Send backup File
If Success
Update BackupFileInfoStatus
Create BackupFileDetail
Delete Compressed File
Else
Set Backup Failed

FIG. 22

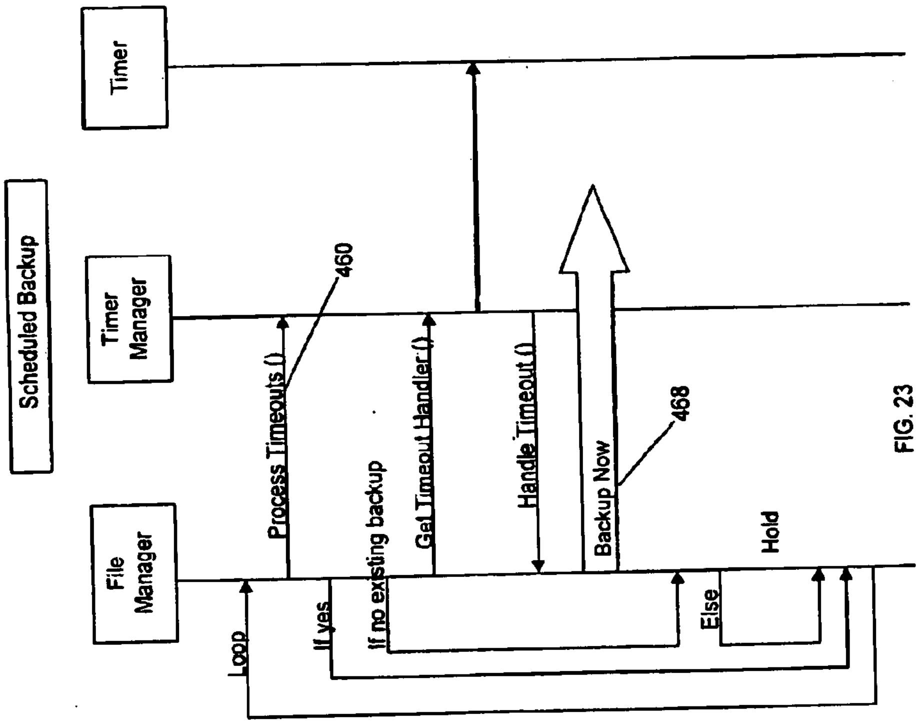

Scheduled Backup
File Manager
Timer Manager
Timer
Process Timeouts ()
460
If no existing backup
Get Timeout Handler ()
Handle Timeout ()
Backup Now
468
Hold
Loop
If yes
Else

FIG. 23

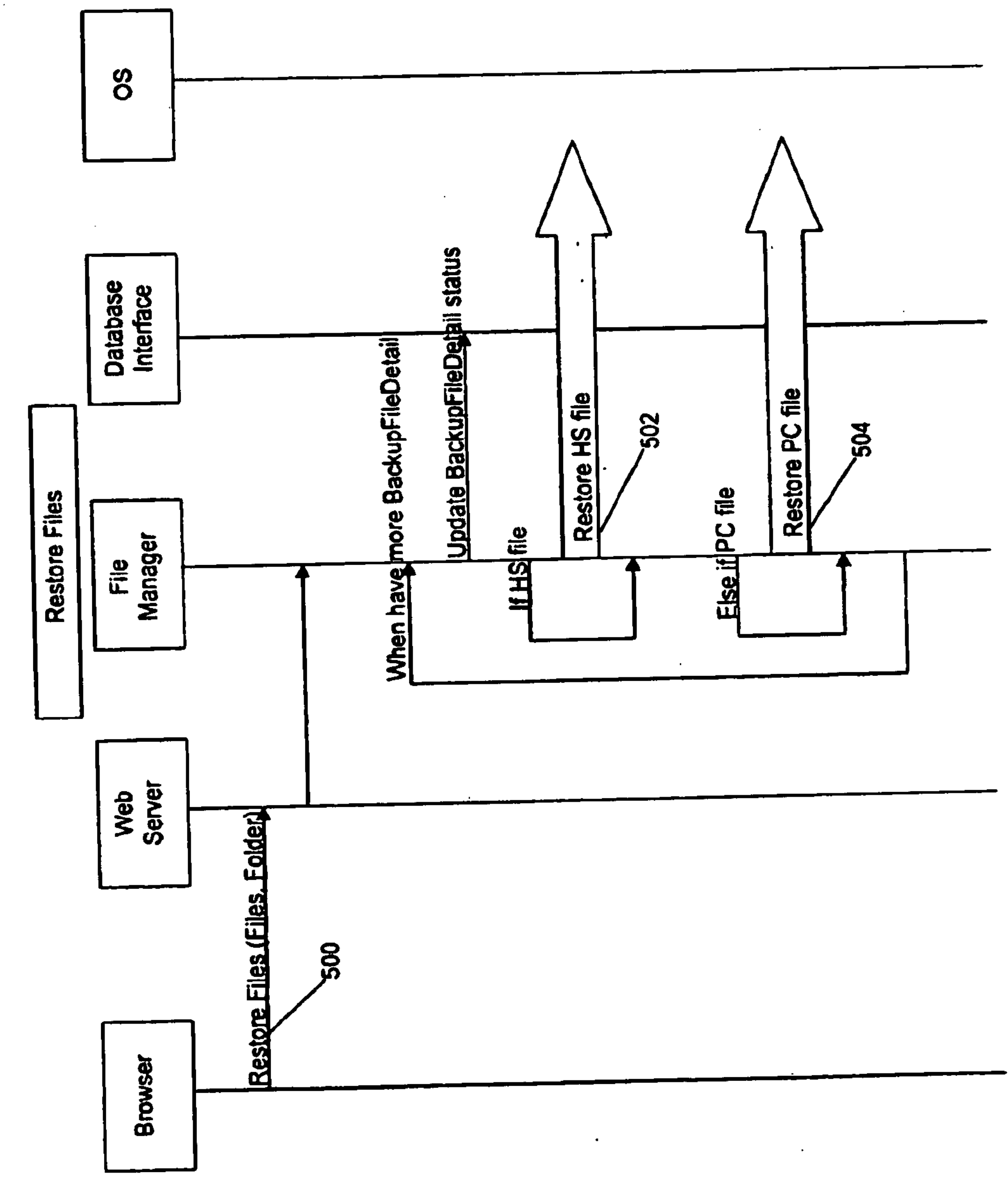

Restore Files
Browser
Web Server
File Manager
Database Interface
OS
Restore Files (Files, Folder)
500
When have more BackupFileDetail
Update BackupFileDetail status
If HS file
Restore HS file
502
Else if PC file
Restore PC file
504

Fig. 24a

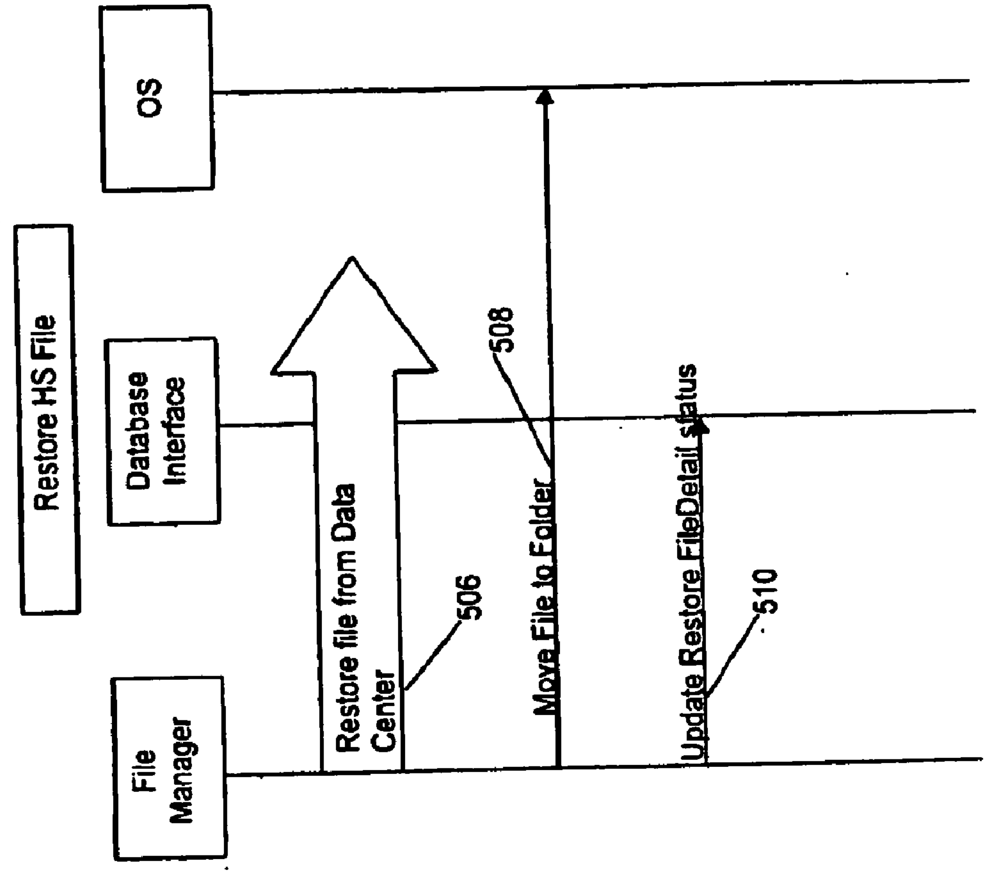

Restore HS File
File Manager
Database Interface
OS
Restore file from Data Center
506
Move File to Folder
508
Update Restore FileDetail status
510

FIG. 24b

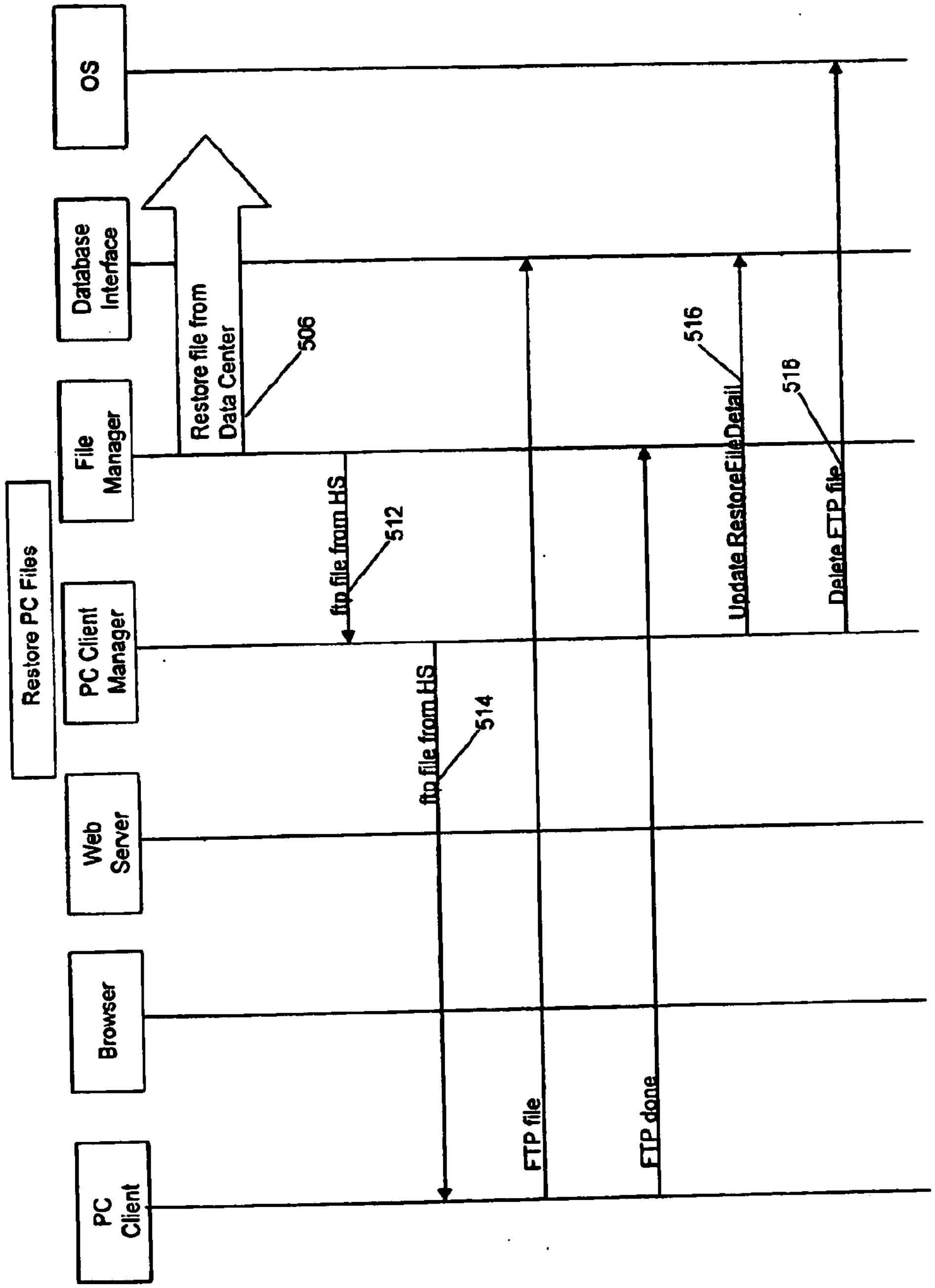

Restore PC Files
PC Client
Browser
Web Server
PC Client Manager
File Manager
Database Interface
OS
Restore file from Data Center
506
ftp file from HS
512
ftp file from HS
514
FTP file
FTP done
Update RestoreFileDetail
516
Delete FTP file
518

FIG. 24c

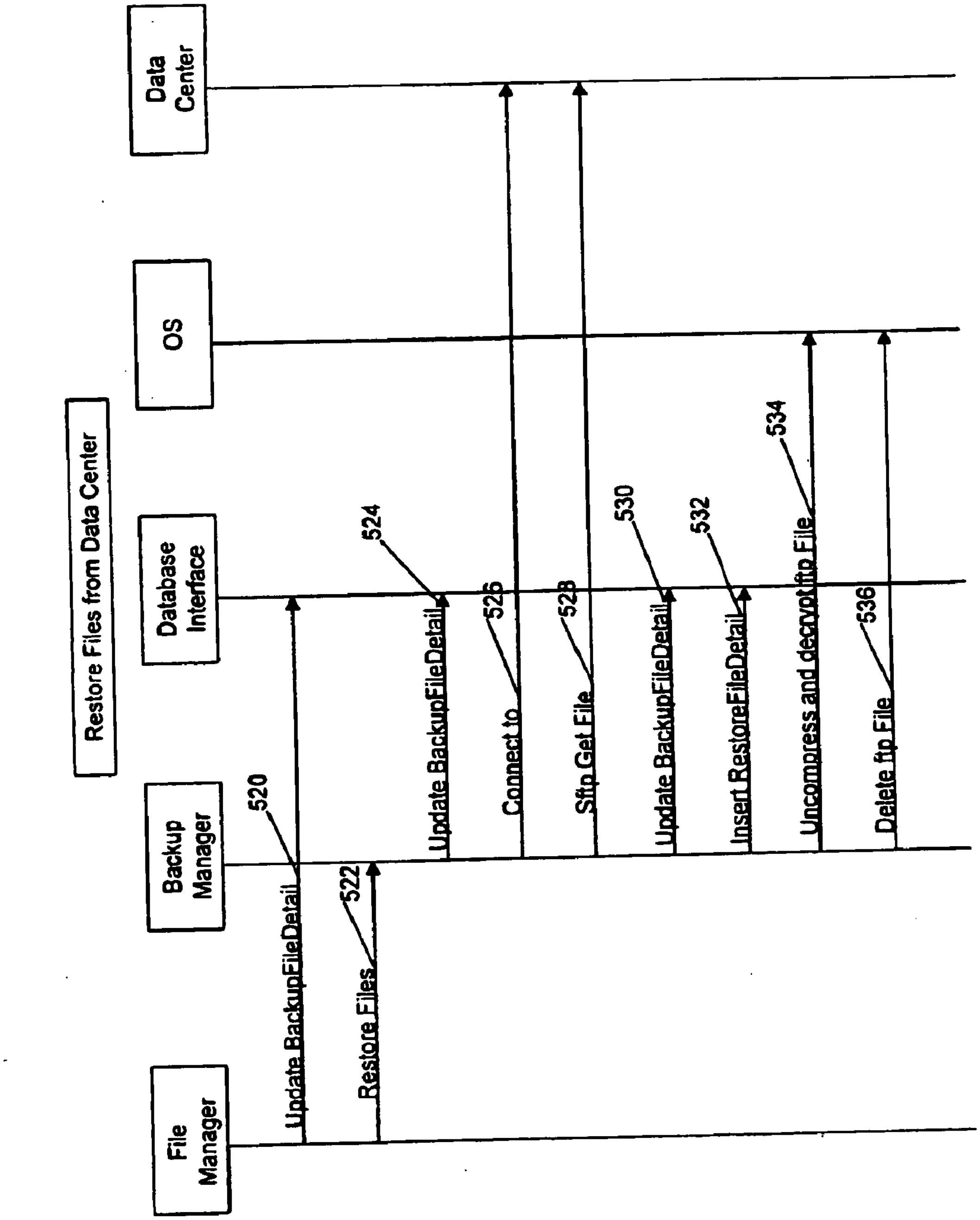

Restore Files from Data Center
File Manager
Backup Manager
Database Interface
OS
Data Center
520
Update BackupFileDetail
522
Restore Files
524
Update BackupFileDetail
526
Connect to
528
Sftp Get File
530
Update BackupFileDetail
532
Insert RestoreFileDetail
534
Uncompress and decrypt ftp File
536
Delete ftp File

FIG. 24d

MANAGED FILE BACKUP AND RESTORE AT REMOTE STORAGE LOCATIONS THROUGH MULTI-SERVICES GATEWAY AT USER PREMISES

TECHNICAL FIELD

[0001] The present subject matter relates to gateway devices and systems, and/or programming for such devices and systems, that provide file backup and restore services for associated endpoint devices.

BACKGROUND ART

[0002] The digital home is now becoming more complex with the myriad of new and emerging digital devices intended to address many user and consumer needs such as communication, entertainment, privacy and security, etc. However, given the complexity of the emerging digital home and digital environments generally, users who are technologically challenged may find it a daunting and intimidating task to manage their home networks and interconnected digital devices. Moreover, new paradigms are emerging oriented to delivering media content to and the consuming of media content at the home. Many of these paradigms rely on communication of application specific data to and/or from the Internet, as opposed to conventional telephone or broadcast video type applications. The protection of received Internet-sourced media content in addition to user-generated media content is additionally an important aspect that may be inadequately addressed by the technologically challenged user. Furthermore, with respect to Internet based data, most of the content delivery solutions are provided to the digital home networks through availability of the "two-foot" interface (i.e. the PC). It is relatively cumbersome to bring this content to the "ten-foot" interface (e.g. the television).

[0003] Thus, a need exists for a technique or devices to simplify the overall management of services and applications available to the digital home or even the small enterprise. Such a technique or devices would reduce the complexity of the maintenance, upgrading, and operation of even the more basic needs addressed by emerging digital endpoint devices and networks. Approaches that suggest greater functionality in home-based appliances fail to reduce or address the complexity of managing and provisioning those appliances. For example, while the home gateway server appliance described in U.S. Pat. No. 6,930,598 enables networked electronic devices to communicate with each other without the direct interaction with external networks, and provides a mechanism whereby a member of the household may be informed of certain network related events without having to use their home computer or other client devices, it does not provide a convenient or simplified way of managing the services and applications executed by, or associated with, that device. Thus, an unmet need exists for a device associated with a user premises that has robust functionality but does not require sophisticated or inordinate attention from the user to manage, provision and utilize them.

[0004] In practice, a customer typically subscribes to basic transport services from a network "Service Provider" (e.g. ISP—Internet Service Provider, cable provider, fixed wireless providers, ILEC—Incumbent Local Exchange Carrier, or CLEC—Competitive Local Exchange Carrier). For example, a customer may have broadband Internet access, via cable modem, digital subscriber line service or the like. Digital video service may be provided separately. The network service provider manages these basic services, at the logical network layer, typically at layers **1**, **2** or **3** of the OSI model. While network services and associated devices may operate minimally at those levels, they operate at those levels only to support operations at OSI layers **1**, **2** or **3**. Many applications, however, involve higher level service logic for applications that view the network transport as a transparent pipe. The current internet applications delivery and management architecture, and many devices or management systems based on it, require a server with robust processing and storage capability to be located at the network operations center, not in the home. For voice over Internet protocol (VoIP) type telephone service, for example, the VoIP service provider operates a session initiation protocol (SIP) server or the like, and each user has only client functionality. The network transport layers are transparent to the IP packets containing the voice and related signaling. The SIP server, however, controls the call set-up, tear-down, billing and the like for the voice call services. With such an architecture, the major capabilities and functionalities connected with providing application services from the server throughout the network reside on the server and supporting elements, all of which are located in the network operations center.

[0005] It might be helpful to walk through examples of the configuration for application services delivery to a client of an application within a user premises under the typical, current network configuration. FIG. **10** depicts one possible configuration for a client application to access a particular service that is being hosted or served outside of the user premises based on the typical, and currently employed, network application service configuration. We identify two regimes in the overall architecture, the Service Provider Network regime (WAN side), and the User Premises Network regime (LAN side). The association between the Service Provider Network and the User Premises Network is broken down into three layers; Network Interconnect Layer (NI), Network Function Layer (NF), and the Application Services Layer (AS). These layers do not represent physical communication pathways, but are a logical representation of pathways and elements employed in a network-based communication.

[0006] The separation between the managed Service Provider Network (WAN side) and the User Premises Network (LAN side) is depicted as the Network Service Provider Demarcation. The Network Service Provider Demarcation at the Network Interconnect Layer represents the logical and physical separation between the user premises and the broadband network. In the present representation of the three functional layers, the Network Service Provider Demarcation is extended into the Services and Application Layer to emphasize the functional barrier at that layer between the Service Provider Network and the User Premises Network, in currently configured networks.

[0007] The NI Layer depicts how the connectivity between a User Premises Network and the Public/Service Provider Network is established. On the Service Provider Network side, the Wide Area Network services are terminated onto a WAN termination device with the appropriate interface (e.g. a Broadband internet service such as ADSL would terminate on to a managed ADSL Terminal Adapter). The WAN termination layer adapts the WAN interface into a compatible LAN interface (e.g. Ethernet or WiFi). On the User Premises Network side the LAN Termination interfaces are used to connect to the Local Area Network via a variety of interfaces, such as Ethernet, WiFi, MOCA, etc.

[0008] The LAN Termination interfaces and the WAN Termination interface could reside on two separate physical devices or they could reside on one physical device. In either case, on the User Premises Network side, packets or data must flow through the NF Layer between the WAN Termination Interface and the LAN Termination Interface. One or both of these interfaces may reside on a "gateway" device. Gateway and like router devices are currently available for various premises that allow several computers to communicate with one another and to share a broadband Internet connection. These devices function as routers by matching local network addresses and the hostnames of the local computers with the actual networking hardware detected. As gateways, these devices translate local network addresses to those used by the Internet for outgoing communications, and do the opposite translation for incoming packets.

[0009] The User Premises NF Layer allows for switching of packets between LAN devices and routing or bridging of packets between the LAN and WAN interfaces. It could physically reside on the same device(s) with the LAN Termination or it could exist at an independent device that could interconnect to the LAN Termination interface via a variety of physical interfaces (e.g. Ethernet, MOCA, etc.). The Service Provider NF Layer provides the Wide Area Network access between the WAN Termination device and the AS Layer where all the applications servers are being hosted. The Internet could be used for this connectivity as could a private packet/cell network (e.g. Cellular packet network, or a private ATM or packet backbone).

[0010] The AS Layer represents the functional layer that provides access to applications services by application clients. On the User Premises side, the AS Layer provides a Firewall to protect the application client from application level attacks from the open Internet. On the Service Provider side, the AS Layer encompasses application services such as Parental Control, Backup, and Call Processing. These application services exist on a managed Application Service Delivery Platform (ASD) on a secure network server that can be hosted at a facility that has private and or public data connection paths. The ASD may include three functional modules, namely the Application Service Enforcement (ASE) module, the Application Service Logic (ASL) module, and the Application Service Management (ASM) module.

[0011] The ASE module is responsible for enforcing the relevant Application Client privileges to the application services. It gets the policies and permissions of each application client from the ASM module (such as provisioning data and subscription data) and enforces those policies against the requested actions by the client application.

[0012] The ASL module executes the application services that the Application Clients request. Such services could be Call Processing, Parental Control, Peered Networking, Backup, etc. The ASL module must interact with the ASM module for monitoring purposes and status information such as Call Data Recording and Billing. It must also interact with the ASE module to provide access to the client applications that have passed the policy enforcement procedures.

[0013] The ASM module, as described above, provides the necessary data to the ASE and ASL modules for them to carry out their respective functions. It also oversees the overall integration and communication among all the modules and the services that are managed by the ASM. The ASM also manages the overall security and integrity of the ASD.

[0014] All ASD modules are in constant communication with each other, preferably through secure connections. The inter-module communication may be managed by the ASM, or may be independent of a central management function. Note that the ASE, ASL and ASM modules are only examples of functions that may be logically bundled; other bundles, and other means of bundling these functions, are possible.

[0015] FIG. **11** depicts a logical flow of how a specific Application Client residing at a user premises could interact with an Application Service that is being managed in the typical network configuration. Traditionally, as depicted in this example, an Application Client (e.g. Telephony) that needs to connect to an Application Service (e.g. call processing) must first connect to the Local Are Network termination interface (**1**). Depending on the specific deployment, a switching function, routing function or bridging function is used to establish the connection path between the application client (**2**) and the Firewall service (**3**). The Firewall Service works in conjunction with the router function (**4**) to permit access to the Wide Area Network interface (**5**) and maintain a level of security to the Application Client. The firewall service in this example is not aware of either the type of application client or the specific application service that is being targeted. There is no feedback mechanism between the Application Service Delivery Platform and the Firewall function. Once connectivity to the WAN termination interface is established, routing mechanisms are used to establish a connection through the Service Provider Network Function Layer (**6**) to the Application Service Layer (**7**). At the Application Service Layer, the client application goes through application validation procedures and privilege and permission checks by the ASE prior to allowing the application client to connect to the desired application service.

[0016] In the logical hierarchy, such as shown in FIGS. **10** and **11**, a home gateway device may implement the NI layer functions and the user premises side NF layer functions. The firewall functionality may reside in the gateway or in one or more other elements on the premises network. For example, many PCs internally implement firewalls, e.g. in close association with the client programming of the endpoint device. As can be seen by the illustrations in FIGS. **11**, however, even with a home gateway deployment for a premises network, the application services functionality still requires the support and service logic to reside on a server in the network. That is, for service provisioning, service management and upgrades, remote diagnostics, for a digital endpoint device such as a PC or SIP phone, the home premises still must rely on the application service logic executed by the service providers in their server networks, typically according to proprietary platforms. Moreover, many other core services, e.g. file storage, media content access and delivery, are offloaded to other 3rd-party service providers that provide service logic and support applications at their network server devices.

[0017] With the paradigm discussed above relative to FIGS. **10** and **11**, it is currently the case that many of the application service providers also find it difficult to provide and support new emerging technologies at the home. That is, service providers are challenged to select a platform that can evolve with their applications. With existing service architectures, the launch of new services compounds complexity to the core network, adding to both capital and operating expenditures.

[0018] Thus, as new services come to the fold, often with the requirement of new equipment, e.g. integrated access devices (IADs) for VoIP and set-top boxes for streaming video, the management of the customer premises equipment (both hardware and software) complicates customer support requirements. Managing the home network environment can be an inhibitor to the adoption of new services, both from the user perspective and from the perspective of management by the service providers.

[0019] One of the services that is needed is that of file backup (and restore) services for a user premises. In many households, there exists a large amount of valuable data scattered across many computers. There is always the possibility that the computers may crash and data cannot be recovered. Typically, any file backup from endpoint devices, such as personal computers (PCs), is performed with a local storage device, such as a backup tape drive, or more recently, through an external disk drive. Such systems and methodologies position the local storage device relatively near the endpoint device, such as in the same residence. Relying on a local storage device for file backup and restore has disadvantages, such as potential loss of the original files and the backup files in the event of a catastrophic event, such as a fire in the premises.

[0020] Backing up files is very cumbersome for a home user, using external drives and backing up data on CDs or DVDs. When one needs to restore the data, one must go through numerous CDs and DVDs to locate the information to be restored. Further, the backup process requires a long period of time, due to the larger and larger amounts of data to be backed up. There is thus a need for providing managed offsite storage from endpoint devices in a secure and indestructible manner.

[0021] A need exists for a new paradigm to achieve this file backup system and method, with improved convenience for the user and easier management for the application service provider. In that regard, it would be desirable to provide a multi-services application gateway device and system that manages offsite file backup for one or more endpoint devices associated with the gateway device.

SUMMARY

[0022] The technology discussed herein may be embodied in gateway devices, typically for deployment at user premises, and/or to programming for devices that may function as such gateways. Such a gateway device comprises a first interface for enabling bi-directional network layer communications with one or more of the endpoint devices associated with the gateway device, a second interface for enabling bi-directional network layer communications for the one or more endpoint devices via a wide area network, and for enabling at least some bi-directional communications with a service management center and at least one storage area external to the premises via the wide area network. The gateway device also comprises a processor configured to manage backups and restores of the data between the one or more of the endpoint devices and the at least one storage area.

[0023] Application service programming is logically positioned on a user premises side of a first logical network demarcation, forming an edge of the wide area network at the user premises. The programming also defines a logical service provider-user demarcation between the user premises and the application service provider. The application service programming resides on the service provider side of this second demarcation and only provides a logical application service interface across that demarcation to deliver an application service to an endpoint device. The logical service provider-user demarcation also provides a demarcation in accessibility to hardware resources of the gateway device, whereby some hardware resources of the gateway device are on the service provider side of the logical service provider-user demarcation and are inaccessible to an endpoint device from the user side of that demarcation.

[0024] In a disclosed example, the demarcation in accessibility to hardware resources of the gateway device, provided by the logical service provider-user demarcation, delineates a portion of the storage accessible by a user via an endpoint device from an application service provider portion of the storage, which contains the application service programming and/or data of the application service provider. For example, the user of an associated endpoint device may be able to store and retrieve data files in the user accessible portion of the storage of the gateway device. The application service provider, in turn, can control storage and retrieval of data files in the application service provider space portion via the of the wide area network. However, the user of the associated endpoint device is prevented from accessing one or more of the data files in the application service provider portion. In one service application, the application service provider can allow storage and retrieval of data files in the application service provider portion via the wide area network, for other gateway devices. In a specific example, the logical location of the demarcation line separating the portions of the storage is controllable by the application service provider, from the service management center, via the wide area network and the second interface.

[0025] The disclosed architecture provides a whole house backup service. The backup and storage can be accomplished offsite in a secure and practically indestructible manner. In certain embodiments, the architecture allows the placement of backup files to the service provider side of the logical server provider side of the logical service provider-user demarcation of the gateway device, and to other gateway devices located on the network through encryption and dispersion of encrypted elements of the backup files and data throughout other gateway devices on the system, or to a centralized data storage system.

[0026] Additional advantages and novel features will be set forth in part in the description which follows, and in part will become apparent to those skilled in the art upon examination of the following and the accompanying drawings or may be learned by production or operation of the examples. The advantages of the present teachings may be realized and attained by practice or use of various aspects of the methodologies, instrumentalities and combinations set forth in the detailed examples discussed below.

[0027] The drawing figures depict one or more implementations in accord with the present teachings, by way of example only, not by way of limitation. In the figures, like reference numerals refer to the same or similar elements.

[0028] FIG. **1** is a layered logical block diagram with arrows representing steps of a sample logical flow, for an application client to access a specific managed application service, in a gateway device-service management center type network configuration, and shows a first or Network Service Provider Demarcation at the network edge.

[0029] FIG. **2** is a high-level depiction of the logical architecture of the software and hardware of a multi-services applications gateway device, together with a network service provider termination apparatus for broadband connection to a wide area network, and shows the first demarcation as well as a second demarcation between the Application Service Provider and the User.

[0030] FIGS. **3**A to **3**C depict the software and hardware architectures of the multi-services applications gateway device.

[0031] FIG. **4** is a network diagram, depicting a gateway device, endpoint devices at the user premises, one or more wide area networks and a service management center.

[0032] FIGS. **5**A and **5**B conceptually depict the demarcation in a storage media that provides isolation of downloaded service logic and associated data for implementing services from service provider and/or downloaded content, from a user generated content.

[0033] FIG. **6** conceptually depicts a virtual hosting (space-sharing) service provided by the gateway device.

[0034] FIG. **7** is a signal flow diagram and FIGS. **8** and **9** are process flow diagrams, which illustrate operations for providing backup services for files to a third party storage provider and peer gateway appliances.

[0035] FIG. **10** is a layered logical block diagram of one possible configuration for service delivery to a client of an application within a user premises based on a typical current network architecture.

[0036] FIG. **11** is similar to FIG. **10**, but overlaid with arrows to show a sample flow of logical steps taken by an Application Client to access a specific managed Application Services in the typical current network configuration.

[0037] FIG. **12** is a block diagram depicting only certain components of the architecture shown in FIGS. **1**-**4** in an arrangement to provide file backup service.

[0038] FIG. **13** is a process flow diagram that illustrates operations to subscribe to a backup service with the disclosed architecture.

[0039] FIG. **14** is a process flow diagram that illustrates operations to cancel a subscription to a backup service with the disclosed architecture.

[0040] FIG. **15** is a process flow diagram that illustrates operations to stop all backups with the disclosed architecture.

[0041] FIG. **16** is a process flow diagram that illustrates operations to start up the file manager depicted in FIG. **12** for the backup operations.

[0042] FIG. **17** is a process flow diagram that illustrates operations to create a backup set with the disclosed architecture.

[0043] FIG. **18** is a process flow diagram that illustrates operations to add a backup file with the disclosed architecture.

[0044] FIG. **19** is a process flow diagram that illustrates operations to modify a backup set with the disclosed architecture.

[0045] FIG. **20** is a process flow diagram that illustrates operations to delete a backup set with the disclosed architecture.

[0046] FIG. **21** is a process flow diagram that illustrates operations to perform an immediate backup operation with the disclosed architecture.

[0047] FIG. **22** is a process flow diagram that illustrates operations to backup one file with the disclosed architecture.

[0048] FIG. **23** is a process flow diagram that illustrates operations to schedule a backup service with the disclosed architecture.

[0049] FIGS. **24***a-d* are process flow diagrams that illustrates operations to restore files with the disclosed architecture.

[0050] In the following detailed description, numerous specific details are set forth by way of examples in order to provide a thorough understanding of the relevant teachings. However, it should be apparent to those skilled in the art that the present teachings may be practiced without such details. In other instances, well known methods, procedures, components, and circuitry have been described at a relatively high-level, without detail, in order to avoid unnecessarily obscuring aspects of the present teachings.

[0051] Architectures and methods are described that provide for offsite backup and storage. The architectures, described in detail below, perform a backup function that places backup files at the restricted portion of the gateway device and distributed to other gateway devices on the network for storage or to a central storage location. This is done securely through encryption and dispersion of the files to be backed up, under the control of the gateway device at the user premises and a service management center. The user is thereby able to subscribe to secure offsite storage for backing up data and restoring it as needed. Before describing the specific operations involving the backup of data, an exemplary architecture for backing up the data is described in detail below.

[0052] The various technologies disclosed herein move application service logic, formerly resident in a network node, into a gateway device in the customer premises. The gateway device is implemented in such a manner as to offer its user many of the applications services, such as were previously offered from network-side servers, from the user premises. A logical Network Service Provider Demarcation is formed at the edge of the wide area network at the user premises, that is to say between the wide area network and the equipment in the user premises. The application service logic resides on the user premises side of this first demarcation. The gateway device programming also defines a logical service provider-user demarcation between the user premises and the application service provider, referred to in later examples as the Applications Service Provider Demarcation. The application service programming resides on the service provider side of Ibis second demarcation and can be controlled or managed by the application service provider, typically by communications through the wide area network. The user's access to the programming and resources between the two demarcations is limited. The application service programming only provides a logical application service interface across the Applications Service Provider Demarcation, for delivery of one or more application services to an endpoint device. The Applications Service Provider Demarcation also provides a demarcation in accessibility to hardware resources of the gateway device, whereby some hardware resources of the gateway device are on the service provider side of the logical service provider-user demarcation and are inaccessible to an endpoint device from the user side of that demarcation.

[0053] In a typical scenario, a network service provider takes responsibility for managing resources on the network side of the Network Service Provider Demarcation, leaving the user to manage everything on the premises side of that first demarcation. However, in the gateway devices discussed below, an application service provider takes responsibility and controls/manages the software and hardware resources between the two demarcations. This approach provides the application service provider with management control over resources in the premises that deliver that providers' higher layer services, and the application service provider can relieve the end user of many of the burdens of managing customer premises resources.

[0054] Examples of application services include one or more of media delivery, content management, access control and use tracking, file sharing, and protection and back-up services of both Internet/Web-generated digital media content and user generated digital media content. The disclosed gateway device thus is configured and programmed to simplify various aspects of managing the emerging home/business digital networks including the myriad of interconnected digital endpoint devices associated with the gateway device. The endpoint devices need not reside within, or be located at, the premises to maintain their association with the gateway device. For many of the exemplary application services, the application service programming between the demarcations in the gateway device implement server functionality for interactive communication with client functionality of the endpoint devices. Application service functionality of the gateway device, as provided by this client-server interaction, is enabled/disabled and configured by the application service provider, via communications between the gateway device and a service management center via the wide area network.

[0055] In this way, the gateway device and service management center move substantial functions performed by the typical network server into the user premises by incorporating those functions between the two demarcations at the gateway device, but in a way that allows for the server functionality to be externally managed by the service management center from the network side, which may be operated by a third-party service provider. in this exemplary architecture, both the server functionality and the application services offered via the gateway device may be managed by the service management center. Moreover, the server function residing in the gateway device is not only located in the premises but it now resides logically on the premises side of the Network Service Provider Demarcation and on the service provider side of the Applications Service Provider Demarcation. In the detailed examples, the gateway device and system architecture place a set of application services on a tightly coupled (e.g. always-on or always-available basis), secure hardware platform that is externally managed.

[0056] Reference now is made in detail to the examples illustrated in the accompanying drawings and discussed below. FIG. **1** is a high-level diagram of the architecture of a gateway-service management center network, as well as the logical flow of how a specific Application Client residing at a User Premises could interact with an Application Service in a gateway device that is being managed in the gateway-service management center network configuration. Heretofore, as described above, many application services that form part of the Application Service Delivery Platform were logically positioned at the AS Layer but on the network side of the Network Service Provider Demarcation (see FIGS. **10** and **11**). FIG. **1** shows that, in the exemplary architecture, many of these application service functionalities that were previously offered from network-side servers have now been moved across the Network Service Provider Demarcation and now logically reside at the AS Layer in the User Premises Network, i.e., on the hardware components located in the user premises, such as, by example, a gateway device. In particular, the programming that implements application services is logically positioned on the user premises side of the Network Service Provider Demarcation. The application service on the user premises side that enforces authorization, authentication, configuration, or use of the respective service via an endpoint device is logically depicted in FIG. **1** as the ASE module in the AS Layer of the User Premises Network. The ASE module may also communicate via the wide area network with the ASM logic residing in the service management center.

[0057] FIG. **1** thus depicts an approach in which the ASL and the ASE functions have moved to the User Premises side. In the example of FIG. **1**, the application client would be implemented on an endpoint device, whereas other elements/functions to the right of the Network Service Provider Demarcation are implemented in a gateway device. As discussed more below, the ASL and the ASE functions are implemented as high-level server type logic within the gateway device at a user premises. Hence, elements shown in FIG. **1** that may reside in the user premises gateway device include the user premises-side network function or NF (switch, router or bridge) and the LAN termination for communication with the endpoint devices implementing the application client functions. Thus, with reference to FIG. **1**, the first interface, as described above, for enabling bi-directional network layer communications on the user's side of the premises with one or more of the associated endpoint devices resides at the NI Layer and provides the LAN Termination referenced therein. FIG. **1** also depicts the WAN termination providing connectivity to the wide area network (network-side NF—Internet or private wide area data network). The gateway device's second interface, as described above, for enabling bi-directional network layer communications for the associated endpoint devices via a wide area network resides at the NI Layer and provides the WAN Termination referenced therein. The gateway device's second interface also enables bi-directional communications between it and the service management center via the WAN.

[0058] With reference to FIG. **1**, the core of the logical capacities of the service management center resides on the Service Provider Network, and is depicted as the Application Service Management (ASM) portion of the Application Service Delivery Platform in the AS Layer. The ASM function is implemented in the service management center, which is external to the user premises, and, perforce, on the network side of the Network Service Provider Demarcation. The ASL and ASE functions maintain logical connectivity or interaction with the Application Service Management (ASM) function in the service management center, typically via communication through a wide area network. This logical connectivity is established through an always-on (or on an as needed, periodic basis), secure communication channel between the User Premises AS Layer (ASL and ASE) and the Service Provider AS Layer (ASM) at the service management center. The service management center and the communications of the center with one or more of the gateway devices provides an infrastructure support and/or management of the application services offered to endpoint devices and their users by the logic implemented in the gateway device(s). Effectively, the ASD, considered in its entirety, extends all the way to the User Premises and traverses the Network and Network Service Provider Demarcation. The secure communications channel is established through the NF Layer and the NI layer.

[0059] The examples discussed herein also introduce a logical platform management layer to the user premises-side, which allows for inter-layer allocation of local resources. This function guarantees access between the Application Service Logic function on the user premises network and the applications service management function in the service management center by assuring that the local user premises hardware and software modules are functioning at a required state (CPU and memory usage, bandwidth usage, QoS settings, etc.) in order for the ASL to have the necessary resources to establish its required communications path to the ASM.

[0060] The platform management layer is also responsible for implementing that part of the managed application services to be performed by the gateway device. In that regard, the platform manager secures and manages the overall hardware platform, given that in this scenario, the NF layer and the AS layer reside on one hardware platform. This secure hardware platform provides a robust and secure operating environment for the AS Layer. So, to establish a secure and robust hardware operating environment, the platform manager must interface with all the layers above it and allow for bi-directional management information flow among all of the functions. For example, if the Application Client is a telephony application and the desired application is call processing, the application must first connect to the LAN termination interface (**1**). Then a connection must be established to the AS Layer through the NF layer (**2**). At this point the platform manager determines if there are sufficient resources available for this to take place on the routing and switching modules and if there is not sufficient resources on either the LAN Termination interface or the NF layer functions, it would take the necessary corrective measure to free up the required resources so that the application can execute properly (e.g. prioritize packets, throttle bandwidth, attempt to reduce noise on an RF interface, or free up time slices on a TDMA interface such as MoCA). Once that is done, the connection is established to the AS Layer (**3**), where the ASE and ASL, having been updated by the ASM in the network, respond instantaneously to the Application Client, completing the service request.

[0061] Application services represent functionalities, implemented in the higher layer(s) of the protocol or logical stack above the network layer(s) that may extend up to the top application layer (layer **7** of the OSI model). An application service, for example, provides application server communication with a client functionality of one or more endpoint devices, for the respective service, communicated on top of network layer communications through the interfaces. In the examples, the services are provided on a subscription service basis to users at the premises. Hence, the application service logic provides enforcement regarding authorization, authentication, configuration, and/or use of the respective service via the endpoint devices. The application service includes service and feature functions, implemented and controlled by the application service logic. Management of the application service is based on communications with the service management center via the wide area network.

[0062] The illustrated architecture of the gateway device-service management center network enables other features and capabilities that have not previously been available to the user. For instance, peer-to-peer application communication between or among gateways is possible without the need to go through, or utilize resources at, an external service management center. Communications through the service management center are also possible. In addition, given the considerable functionality present in the gateway device, and its ability to manage the various endpoint devices associated with it (as explained below), the user interface with the gateway can be presented and utilized on the home TV. Additionally, information from other endpoint devices, such as the PC, network sources (such as an RSS (Really Simple Syndication) service), may now be overlaid on the TV screen so that, for example, PC messages, or weather information, can be viewed on the TV screen, and the functionality of the PC (or other home-networked endpoint devices) can be accessed from the TV screen.

[0063] As shown by the discussion of FIG. **1**, application service programming is logically positioned on a user premises side of a logical network demarcation forming an edge of the wide area network at the user premises, that is to say on the user premises side of the Network Service Provider Demarcation. The gateway device programming however, also defines a logical service provider-user demarcation between the user premises and the application service provider, as will be described in more detail with regard to FIG. **2**.

[0064] FIG. **2** depicts logical and physical elements as may be deployed at a user premises. At the Physical/Network layer shown therein, the drawing shows an example of user premises hardware components required for delivering data services (i.e. Internet connectivity) along with a separate, non-integrated managed hardware used in delivering a set of managed application services (e.g. IM, VOD, IP telephony). The Network Service Provider Wide Area Network Termination Apparatus (NSP-TA) allows for a typical termination of a Wide Area Network Services connection, such as DSL, Cable, Fiber, etc, by a network services provider. The NSP-TA provides the WAN Termination in the NI Layer (FIG. **1**). The NSP-TA may be an existing user-premises device, provided by the carrier supplying network services to the premises. FIG. **2** also depicts the Network Service Provider Demarcation at the hardware level.

[0065] If configured as a standalone device, the NSP-TA device is required to have its own CPU, Memory, physical interfaces and logic control. In order for Network Service Providers to deliver managed services, they typically require a management element controlled by the CPU on the NSP-TA. To depict these logical elements residing on the hardware components, FIG. **2** includes a representation of the user premises Application Services Layer above the hardware layer. This layer corresponds to the AS Layer of FIG. **1**, but without reference to any logical elements residing at the network services provider. The management element, represented by the Network Service Provider Managed Application, allows the network service provider to determine the status of the network hardware device and interfaces as well as maintain a certain degree of security enforcement at the customer premises.

[0066] As noted, the network service functionality is at the Ni and NF Layers and generally does not extend to the AS Layer(s) beyond basic authentication, authorization and state management. As with the hardware components, the logical elements also have a Network Service Provider Demarcation as shown in FIG. **2**. On the WAN side, depicted as the Network Service Provider Managed Applications side, of the Network Service Provider Demarcation, resides the applications that are managed, and under the exclusive control, of the network service provider (the Network Service Provider Logic). The User Interface to Managed Applications is present on the LAN side of the Network Service Provider Demarcation within the Application Services Layer. Within this interface resides programming and logic available to users other than the network service provider referred to as the Network User Controlled Logic. The Network User Controlled Logic, which is depicted at the Application Services Layer in FIG. **2**, provides a user interface to the Network Service Provider Logic and, to the extent permitted by the Network Service Provider Logic, interaction with or communication between the user and network service provider through the Network User Controlled Logic and the Network Service Provider Logic, and to the NSP-TA hardware components. The Network User Controlled Logic allows for the User of the hardware to make certain, minimal programming changes relevant to their preferences (e.g., user name and password changes, local IP addresses changes, local interface selection). All user devices typically can only communicate with the NSP-TA through one or more of the User Premises Network Interfaces. The user can modify the Network User Controlled Logic through the User Premises Network Interface. The Network Service Provider Demarcation is typically within the NSP-TA, logically dividing the Network Service Provider Interface and the User Premises Network Interface modules. The network service provider does not have any in-depth visibility or significant responsibility beyond the Network Service Provider Demarcation.

[0067] In the example, the User Network and Application Delivery Apparatus (UNA-DA), shown on the right hand side of FIG. **2**, is a separate managed gateway device **10** that a managed-service provider (which may be different than the network service provider) would control in delivering a set of application services to the user premises. This device is required to have its own dedicated CPU, memory, logic control, as well as its own dedicated set of interfaces. The UNA-DA includes one or more Network Interfaces providing connectivity to the NSP-TA as well as to user premises endpoint devices. The interfaces provide the LAN Termination functionality at the NI Layer (FIG. **1**). One skilled in the art will readily recognize, however, that the physical connection that connects the UNA-DA to the NSP-TA also provides connectivity for the UNA-DA to the public (WAN side) network, and is the means by which the UNA-DA accesses the public network. The end point devices connected to the LAN Interface are on the private (LAN) side of that interface. The UNA-DA also includes a switch, router or bridge for the NF Layer.

[0068] Programming elements of the UNA-DA in the gateway device **10** are depicted at the Application Services Layer of the UNA-DA. Certain logical elements, depicted as the Application Service Provider Managed Applications and Platform in FIG. **2**, on which resides, inter alia, the programming corresponding to the ASL and ASE of FIG. **1**, are managed by the managed application service provider's network control center, e.g. by the ASM through a wide area network (WAN) by means of a control channel to the Application Service Provider Managed Applications and Platform. The Application Service Provider Managed Applications and Platform includes a platform management logic module that, with other programming in the Platform and the ASM, allows the managed application service provider to control the hardware elements of the UNA-DA in addition to any other relevant application services logic or hardware that may reside on the user premises. For example, this programming enables a managed application service provider to control and manage the hardware elements on the UNA-DA to ensure proper use and allocation of the UTA-DA's processing, memory, storage, and bandwidth, to monitor local hardware security and generate needed alarms or protection sequences, and to prioritize applications based on a set of established policies. The user would have control over specific parameters of application services obtained through the UNA-DA, through the User Interface and Platform to Managed Applications (User Controlled Logic) shown in FIG. **2**. These parameters allow the user to control the local behavior of the interfaces and to configure the specific applications to accommodate the user network as configured by the user and to implement the user preferences for those applications.

[0069] Hence, FIG. **2** illustrates the logical architecture of the software and hardware of the UNA-DA in the form of a multi-services applications gateway device **10**, together with a network service provider termination apparatus for broadband connection to a wide area network in this case implemented by the NSP-TA. The gateway device **10** is an application delivery apparatus, for delivering application services to endpoint devices using network layer communications through the network termination apparatus and the wide area network. The drawing also illustrates relevant demarcations between functionalities of the gateway device and termination, which delineate control/management access. The arrangement of the ASL and ASE logic between the two demarcations and the attendant logical demarcations in management access to the hardware resources at the premises result in significant management control by the application service provider and relieve the user of significant burdens in arranging and configuring the systems/services at the premises. Hence, we will consider the demarcations and the resulting relationships to the provider and the user at the various layers, in more detail.

[0070] As outlined above, the logical Network Service Provider Demarcation is formed at the edge of the wide area network (WAN) at the user premises, that is to say between the WAN and the equipment in the user premises. The arrows at the bottom of FIG. **2** show that the area covered to the LEFT of the Network Service Provider Demarcation (as depicted by the lower arrow on the left of vertical plane) is the Network Service Providers responsibility. From the perspective of a network service provider, anything to the RIGHT of that first demarcation (as depicted by the lower arrow on the right of the vertical plane) normally would be the customer's responsibility. As shown, this separation at the first demarcation includes delineation among the hardware elements for the NSP-TA.

[0071] As shown in FIG. **2**, the application services layer also defines an Application Service Provider Demarcation, which extends through the hardware modules on the "Hardware Components" plane as well as the programming in the logical application services plane. In this way, the drawing depicts those modules that are under the responsibility of Application Service Provider (as depicted by the top middle bi-directional arrow). On the logic plane, the user can interact with the managed services through the Application Services Interface function **140**, and the Application Service Provider can interact with the Network Service Provider's managed Applications through the Network Service Provider Managed Application function. This is an optional function but it helps show how the UNA-DA can interface with Network devices from a network services provider, and provide a unified application interface to both hardware elements (NSA-TA, UNA-DA). This management relationship is represented by a dotted line on the logic layer between the Platform Management Logic module **110** and the network service provider management application in the NSP-TA. In effect, the application service provider can "manage" the NSP-TA for the user, even though it is not the application service provider's hardware. In the case where the application service provider is a network service provider as well (the NSP-TA is the application service provider's own hardware), then it would work in practically the same way.

[0072] FIG. **2** also shows how the programming effectively partitions the hardware at the Application Service Provider Demarcation, which gives the application service provider the ability to provide a managed Peer-2-Peer private service that will enable that provider to use the UNA-DA for performing distributed computing, search, indexing, file backup, sharing, etc., all managed and controlled by the provider's service management center.

[0073] The arrows at the top of FIG. **2** thus show the delineations in management responsibility created by the two logical demarcations. As at the bottom, the area covered to the LEFT of the Network Service Provider Demarcation (as depicted by the upper arrow on the left of first vertical plane) is the Network Service Provider's responsibility. Anything to the RIGHT of that second demarcation plane (as depicted by the upper arrow on the right of the second vertical plane) would be the customer's responsibility. However, the logic and hardware in the NSP-TA between the two vertical planes (as depicted by the upper arrow on the left of second vertical plane) is the Application Service Provider's responsibility. As noted above, a logical interface may be provided to the NSP-TA may enable the Application Service Provider's to assume the user's responsibility in managing the premises side of the NSP-TA as depicted by the upper arrow on the right of the first vertical plane.

[0074] To identify the separation of, and distinguish between, the programming and hardware components subject to control by the application service provider and those subject to control by the user premises, FIG. **2** identifies a dividing line across the logical elements of the UNA-DA, and a corresponding dividing line across hardware components, referred to as the Applications Service Provider Demarcation. The Applications Service Provider Demarcation is flexible in that it may extend logically through the Application Services Interface (and, in a hardware context, through the Network Interface) to other devices that are under the logical control of the Application Services Provider Managed Applications and Platform, given that "services" are not restricted to a specific hardware boundary.

[0075] There is no hard requirement for cross management between the UNDA-DA and the NSP-TA. Under this first scenario the user is responsible for making the configuration changes in the specific user controlled logic modules in order to get the two devices to communicate with each other. Optionally the two sub-systems can be combined together, either physically in one hardware device, or logically as two separate hardware devices, but having one managed interface.

[0076] As noted, the two hardware regimes described above (NSP-TA and the UNA-DA) may be combined into one managed hardware platform and, thereby, replace the need for the user to have access to the User Premises Network Interface with the logic residing in the Platform Management logic module of the Application Service Provider Managed Applications and Platform (compare to above-discussed FIG. **10**). This would in effect replace the "user" access with a managed "machine" access, for aspects of the NSP-TA, as well as aspects of the application services offered through the UNA-DA. Thus, the combination creates an integral gateway device providing both network service and application services, under centralized management. Although integrated, network interconnect functions of the NSP-TA may still be managed by the network service provider, as in the example of FIG. **2**. Those skilled in the art will readily see additional combinations and configurations for the hardware comprising the NSP-TA and the UNA-DA. For example, in a further embodiment, all the hardware dedicated to the Network Service Provider Interface may reside and be integral with the hardware comprising the UNA-DA. Thus, the hardware for the WAN interface may reside on the UNA-DA.

[0077] The composition of the premises gateway device **10**, earlier described with reference to FIG. **2**, is now described in greater detail with reference to that drawing together with FIGS. **3A-3C**. FIG. **2** illustrates the relationship of the demarcations to hardware and software of the gateway device **10** and an associated NSP-TA device providing the wide area network termination at the user premises. As shown in FIGS. **3**A and **3**B, the gateway device **10** utilizes a layered architecture, which enables the encapsulation of similar functionality and the minimization of dependencies between functions in different layers. FIG. **3**A shows the lower portion of the layered architecture, and FIG. **3**B shows the upper portion of the layered architecture. The completed set of layers can be conceptualized as if FIG. **3**B was combined with FIG. **3**A, with the layers of FIG. **3**B above those of FIG. **3**A. FIGS. **2**, **3**A and **3**B also depict exemplary functionality (hardware and logical) resident in each of the layers.

[0078] The layers include a hardware layer **102**, and device driver software **104** for allowing the processor to operate other hardware elements of the gateway device **10**. FIG. **3**C is a functional block diagram illustrating interconnection of exemplary elements of the hardware layer **102**.

[0079] The logical elements of the NI Layer residing on the gateway device **10** are found in the Hardware Drivers **104**, which govern the operation of the Hardware Components **102**. The processor runs an operating system shown at layer **106**, which plays a role in each of the NI, NF, AS and Platform Management Layers (FIG. **1**). The layered architecture **100** also includes software for systems services **108** and for the platform management layer shown at **110** in this drawing. Logical elements represented by the NF Layer depicted in FIG. **1** are comprised of elements from the system services **108**. In a similar fashion, the Platform Management Layer depicted in FIG. **1** is implemented in the exemplary architecture of FIGS. **2**, **3**A and **3**B by the platform modules **109** and the platform management layer **110**.

[0080] Particular logical elements comprising the ASL and ASE functionalities of the AS Layer represented in FIG. **1**, and that reside on the gateway device **10** (predominately in the Application Service Provider Managed Applications and Platform of the UNA-DA shown in FIG. **2**) are depicted in FIG. **3**B, and comprise logical elements from each of services framework **120** and application services **130**. The layered architecture facilitates reuse or sharing of logic across the layers to provide a managed service framework **120**. The service management functionality provided by the framework **120** enables deployment of new services as pluggable modules comprising computer readable instructions, data structures, program modules, objects, and other configuration data, in a plug and play fashion. The layered service architecture additionally provides the gateway device **10** with intra-process communication and inter-process communication amongst the many services and modules in the service framework layer **120** that enables the provisioning, management and execution of many applications and services **130**, depicted e.g. services A; B . . . N at the gateway device **10**. Additionally provided are the application service interfaces **140** that enable communications from user endpoint devices with service environments. In that regard, the interfaces **140** enable the application service logic **130** to act as an appropriate server with respect to client device application or service functionality of the endpoint devices. The application service interfaces **140** also enable corresponding interfaces for the application services with aspects of service environments implemented outside the user premises. In that regard, the interfaces **140** enable the application service logic **130** to act as an appropriate client, for extending the application or service related communications to a server accessed via the wide area network **99**, such as a server of the service management center **50**. For example, the gateway device may appear as a SIP server to a SIP client in an end point device, e.g. for a VoIP telephone service; but the gateway device will appear as a SIP client with respect to some related functions provided by a server (such as a SIP directory server) provided by the service management center **50**.

[0081] FIG. **2** thus depicts a high level service framework upon which are built services, e.g. downloaded via the service management center network **50** and a wide area network as packages that are developed and offered by a service entity for customers. These services may be offered as a part of a default service package provisioned and configured at the gateway device **10**, or provisioned and configured subject to user subscription and may be added at any time as plug-in service modules in cooperation with the service management center, as discussed later. It is understood however, that while the gateway device **10** includes much of the intelligence or service logic for providing various services, it is also possible that for some services, some or all of service logic may reside in the service management center network and/or with a third party provider.

[0082] As shown, the base support layer **102** comprises hardware components including a processor device **152**, e.g. a system on chip central processing unit ("CPU") that includes processing elements, digital signal processor resources and memory. The CPU **152** is also coupled to a random access memory or "RAM" (see FIG. **3**C) and additionally, non-volatile hard drive/disk magnetic and/or optical disk memory storage **154**. Generally, the above-identified computer readable media provide non-volatile storage of computer readable instructions, data structures, program modules, objects, service configuration data and other data for use by the gateway device. The non-volatile hard drive/disk magnetic and/or optical disk memory storage **154** may be partitioned into a network side which is the repository for storing all of the service logic and data associated with executing services subscribed to by the user, and, is invisible to the user, and, a user side for storing user generated content and applications in which the user has visibility. Although not shown, the CPU **152** may be coupled to a microcontroller for controlling a display device.

[0083] Additional hardware components include one or more Ethernet LAN and WAN interface cards **155**, **156** (e.g. 802.11, T1, T3, 56 kb, X.25, DSL or xDSL) which may include broadband connections (e.g. ISDN, Frame Relay, ATM, Gigabit Ethernet, Ethernet over SONET, etc.), wireless connections, or some combination of any or all of the above. The card **155** referred to as the LAN interface card provides data communication connectivity within the user premises, essentially, for communication via a user premises network **60** with any endpoint devices operating within the premises. The card **156** referred to as the WAN interface card provides data communication connectivity for the gateway device **10** and endpoint devices communicating through the device **10**, with the wide area IP network **99**. For additional or alternative customer premises communications, the hardware components **102** may also include one or more USB interfaces **158**; and for additional or alternative communications with the wide area network, the hardware components may also include the PCMCIA EvDO interface card **160**.

[0084] A data encryption/decryption unit **162** is additionally provided as part of the architecture for providing data security features. A watchdog timer element or like timer reset element **164** is provided as is one or more LED devices **166** for indicating status and other usable information to users of the gateway device **10**.

[0085] The gateway device provides an in-premises footprint enabling the service connectivity and local management to client(s). The implementation of functions and the related control such as a router (with quality of service (QoS)), firewall, VoIP gateway, voice services and voice mail may be embodied and performed within the CPU **152**.

[0086] The discussion of the gateway hardware layer above and the illustration thereof in the drawings provides a high-level functional disclosure of an example of the hardware that may be used in the gateway device. Those skilled in the art will recognize that the gateway device may utilize other hardware platforms or configurations.

[0087] Continuing, as shown in FIG. **3**A, the device driver layer **104** comprises a multitude of driver interfaces including but not limited to: a PCMCIA driver **104***a,* for enabling low level communication between the gateway CPU **152** and the PCMCIA network interface card wireless interface, an IDE driver **104***b* for enabling low level communication between the gateway CPU **152** and the local mass memory storage element, and LAN/WAN drivers **104***c* for enabling low level communication between the gateway CPU **152** and the respective network interface cards **155** and **156**. The exemplary driver layer also includes an LED driver/controller **104***d* for driving LED(s) **166**, a USB driver **104***e* allowing CPU **152** to communicate via USB interface **158**, and an 802.11 b/g (or n) wireless network driver **104***f* for allowing the CPU **152** to communicate via the access point **62**. The drivers provide the logical connectivity between the low level hardware devices **102** and the operating system **106** which controls the execution of computer programs and provides scheduling, input-output control, file and data management, memory management, and communication control and related services for the gateway device. With respect to the operating system **106**, the gateway computing may support any embedded operating system, any real-time operating system, any open source operating system, any proprietary operating system, or even any operating systems for mobile computing devices as long as the operational needs of the client discussed herein below can be met. Exemplary operating systems that may be employed include Windows®, Macintosh®, Linux or UNIX or even an embedded Linux operating system. For instance, the gateway device **10** may be advantageously provided with an embedded operating system **106** that provides operating system functions such as multiple threads, first-in first-out or round robin scheduling, semaphores, mutexes, condition variables, message queues, etc.

[0088] Built upon the system operating system **106** is a system services support layer **108** providing both client-like and server-like functions that enable a wide range of functionality for the types of services capable of being managed by the gateway device **10**. For instance, there is provided a Dynamic Host Configuration Protocol (DHCP) client and server software modules. The DHCP client particularly requests via a UDP/IP (User Datagram Protocol/Internet Protocol (e.g. Ipv4, Ipv6, etc.) configured connection information such as the IP address that the gateway device **10** has been dynamically assigned by a DHCP service (not shown), and/or any the subnet mask information, the gateway device should be using. The DHCP server dynamically assigns or allocates network IP addresses to subordinate client endpoints on a leased, e.g. timed basis. A Virtual Private Network (VPN) client may communicate via a proxy server in the service control network **50**, according to a VPN protocol or some other tunneling or encapsulation protocol. An SMPT client handles incoming/outgoing email over TCP, in accordance with the Simple Mail Transfer protocol. A Network Time Protocol (NTP) (RFC **1305**) generates and correlates timestamps for network events and generally provides time synchronization and distribution for the Internet. A Domain Name Server (DNS) client and server combination are used by the IP stack to resolve fully-qualified host or symbolic names, i.e. mapping host names to IP addresses.

[0089] An HTTP(S) server handles secure Hypertext Transfer Protocol (HTTP) (Secure Sockets Layer) communications and provides a set of rules for exchanges between a browser client and a server over TCP. It provides for the transfer of information such as hypertext and hypermedia, and for the recognition of file types. HTTP provides stateless transactions between the client and server.

[0090] A Secure File Transfer Protocol (SFTP) client and server combination govern the ability for file transfer over TCP. A SAMBA server is an Open source program providing Common Internet Files Services (CIFS) including, but not limited to file and print services, authentication and authorization, name resolution, and service announcement (browsing). An EvDO/PPP driver includes a Point-to-Point Protocol (PPP) daemon configuration for wireless broadband services. A PPPoE (Point-to-Point Protocol over Ethernet) client combines the Point-to-Point Protocol (PPP), commonly used in dialup connections, with the Ethernet protocol; and it supports and provides authentication and management of multiple broadband subscribers in a local area network without any special support required from either the telephone company or an Internet service provider (ISP). The gateway device **10** is thus adapted for connecting multiple computer users on an Ethernet local area network to a remote site through the gateway and can be used to enable all users of an office or home to share a common Digital Subscriber Line (DSL), cable modem, or wireless connection to the Internet. A Secure Shell or SSH server implemented with HTTP protocol provides network protocol functionality adapted for establishing a secure channel between a local and a remote computer and encrypts traffic between secure devices by using public-key cryptography to authenticate the remote computer and (optionally) to allow the remote computer to authenticate the user.

[0091] Additionally provided as part of the system services layer **108** is intelligent routing capability provided by an intelligent router device **185** that provides Quality of Service (QoS, guaranteed bandwidth) intelligent routing services, for example, by enforcing routing protocol rules and supporting unlimited multiple input sources and unlimited multiple destinations and, particularly, for routing communications to networked digital endpoint devices subordinate to the gateway. A central database server **183** handles all of the database aspects of the system. For example, the database server **183** maintains and updates registries and status of connected digital endpoint devices, maintains and updates service configuration. data, services specific data (e.g. indexes of backed-up files, other service specific indexes, metadata related to media services, etc.) and firmware configurations for the devices. The database server **183** may also store billing and transaction detail records and performance diagnostics. The database server logic **183** also satisfies all other database storage needs as will be described in greater detail herein.

[0092] Referring back to FIGS. **2** and **3**A, built on top of the system services layer **108** is the platform module layer **109**. The platform module layer **109** provides a software framework for operating system and communications level platform functionality such as CPU management; Timer management; memory management functions; a firewall; a web wall for providing seamless WWW access over visual displays via access technologies enumerated herein, e.g. HTTP, SMS (Short Messaging Service) and WAP (Wireless Access Protocol); QoS management features, bandwidth management features, and, hard disk drive management features. The layered architecture further provides a platform management layer **110** as shown in FIG. **3**B, which together with the platform modules **109** implement the platform management layer/logic discussed earlier (with regard to FIG. **1**). In the layered architecture, the platform management layer **110** (and elements shown above it in FIG. **3**B) is built upon the platform modules **109**.

[0093] The features/functions in the layer **110** include a platform manager module which will implement unique rules based notification services. On operational failure, for example, when one of the components or services fails, the platform manager would detect this failure and take appropriate action such as implement a sequence of rules to provide notification to a user. A scheduler module manages scheduled device maintenance, managing scheduled services, e.g. back-up services, etc. The layer **110** also includes a diagnostics module and a firmware upgrades management module for managing firmware upgrades. A resource management module manages system resources and digital contention amongst the various resources, e.g. CPU/Bandwidth utilization, etc. A display management module and a logger management module store and track gateway log-in activity of users and applications, e.g. voice call logs, at the user premises. The platform management layer **110** in concert with resource and service management components enforces the separation of network side managed service control and user side delegations depending upon service subscriptions and configurations. For example, the platform and resource management encompass rules and guidelines provided according to subscribed services that act to enforce, manage and control input/output operations, and use of hard drives space etc. A demarcation point, logically depicted as the Application Service Provider Demarcation in FIG. **2**, is thus defined that provides a hard line between what is "owned by" the customer and what is "owned by" the application service provider.

[0094] The logical platform management layer **110** allows for inter-layer allocation of local resources. This function guarantees access between the application service/management logic implemented at the higher layers in the gateway device **10** and the applications service management function in the service management center **50**, by assuring that the local user premises hardware and software modules are functioning at a required state (CPU and memory usage, bandwidth usage, QoS settings, etc.). The platform manager is also responsible for implementing that part of the managed application services to be performed by the gateway device. In that regard, the platform manager secures and manages the overall hardware platform, given that in this scenario, the network function layer and the application service layer reside on one hardware platform. This secure hardware platform provides a robust and secure operating environment for the application services layer. So, to establish a secure and robust hardware operating environment, the platform management layer must interface with all the layers above it and allow for bi-directional management information flow among all of the functions.

[0095] Referring back to FIGS. **2** and **3**B, built on top of the platform management layer **110** is the Services Framework **120**, which provides a library of application support service processes that facilitate data collection and data distribution to and from the multimedia endpoint devices. The application support service processes include, but are not limited to: an authentication manager for use in authenticating devices connected to the gateway device; a billing manager for collecting and formatting service records and service usage by endpoint devices, e.g. calls, back-up services etc.; a fault manager for detecting and managing determined system and/or service faults that are monitored and used for performance monitoring and diagnostics; a database manager; a control channel interface via which the gateway initiates secure communications with the operations support infrastructure; a configuration manager for tracking and maintaining device configuration; a user manager, a service manager for managing service configuration and firmware versions for subscribed services provided at the gateway device; and a statistics manager for collecting and formatting features associated with the gateway device. Statistics may relate to use of one or more services and associated time-stamped events that are tracked.

[0096] Built on top of the Services Framework layer **120** is the Application Services layer **130** providing library of user application services and application support threads including, but not limited to: file sharing functionality; backup services functionality; home storage functionality; network device management functionality; photo editing functionality; home automation functionality; media services functionality; call processing functionality; voice mail and interactive voice response functionality; presence and networking functionality; parental control functionality; and intelligent ads management functionality. The multi-services applications gateway **10** further provides application service interfaces **140** that are used to enable a variety of user applications and communications modalities.

[0097] For instance, the SIP Interface **141** is an interface to the generic transactional model defined by the Session Initiation Protocol (SIP) that provides a standard for initiating, modifying or terminating interactive user sessions that involve one or more multimedia elements that can include voice, video, instant messaging, online games, etc., by providing access to dialog functionality from the transaction interface. For instance a SIP signaling interface enables connection to a SIP network that is served by a SIP directory server via a Session Border Controller element in the service management center.

[0098] The Web Interface **142** enables HTTP interactions (requests and responses) between two applications. The Web services interface **149** provides the access interface and manages authentication as multi-services gateway devices access the service management center via web services. The IM Interface **144** is a client that enables the multi-services gateway device **10** to connect to one or more specific IM network (s). As further shown in FIG. **3**B, the UpNp (Universal Plug and Play) interface enables connectivity to other stand-alone devices and PCs from many different vendors.

[0099] The XMPP interface **145** is provided to implement the protocol for streaming (XML) elements via the gateway device **10**, in order to exchange messages and presence information in close to real time, e.g. between two gateway devices. The core features of XMPP provide the building blocks for many types of near-real-time applications, which may be layered as application services on top of the base TCP/IP transport protocol layers by sending application-specific data qualified by particular XML namespaces. In the example, the XMPP interface **145** provides the basic functionality expected of an instant messaging (IM) and presence application that enable users to perform the following functions including, but not limited to: 1) Exchange messages with other users; 2) Exchange presence information with other devices; 3) Manage subscriptions to and from other users; 4) Manage items in a contact list (in XMPP this is called a "roster"); and 5) Block communications to or from specific other users by assigning and enforcing privileges to communicate and send or share content amongst users (buddies) and other devices.

[0100] As noted, FIG. **3**C provides a functional block diagram of exemplary elements of the hardware layer **102**. For example, a system on a chip provides the CPU **152** and associated system components. The CPU **152** is also coupled to a random access memory ("RAM") and flash memory. The system on a chip also includes a hard drive controller for controlling a hard disk drive, and together the controller and drive form the hard disk example of the storage **154**. An Ethernet switch and associated LAN port(s) provide the Ethernet LAN interface **155**; and the Ethernet switch and associated WAN port provide a landline implementation of the WAN interface **156**L, for connection to a broadband modem or the like implementing the NSP-TA. The WAN interface may also be wireless, as implemented at **156***w* for example by a wireless WAN module and associated antenna. An example of such an interface would be the EvDO interface discussed earlier. If the gateway device uses the wireless WAN interface **156***w*, there would be no separate NSP-TA.

[0101] In the example of FIG. **3**C, a USB controller in the system on a chip and one or more associated USB ports provide the USB interface **158**. The USB interface **158** may provide an alternate in-premises data communication link instead of or in addition to the wired or wireless Ethernet LAN communication. The system on a chip includes a security engine, which performs the functions of the data encryption/decryption unit **162**.

[0102] The hardware layer **102** may also include an option module. The UNA-DA hardware components at layer **102** have multiple interfaces for connection to such an option module. These interfaces, by way of example, could be a data bus (e.g. PCI, etc), network interface (e.g. Ethernet (RJ45), MoCA/HPNA (Coax)) and Power feeds. The option module allows additional functionality to be added to the base UNA-DA functionality of the gateway device. For example, this additional functionality could be everything from support for a variety of extra Wide Area Network Interfaces (e.g. xDSL, DOCSIS, Fiber (PON), Cellular Packet, WIMAX, etc.), Media Processing (e.g. Cable TV termination, Digital Video Recording, Satellite TV Termination, etc); to Voice Processing (FXS, FXO, Speech Detection, Voice to Text, etc). The option module may have its own standalone CPU, Memory, I/O, Storage, or provide additional functionality by its use of the CPU, Memory, I/O, and storage facilities off of the main hardware board. The option module may or may not be managed directly by the Platform Management of the UNA-DA.

[0103] Those skilled in the art will recognize that functions of the service management center, which reside in the Application Service Management node on the Service Provider Network, as depicted in FIG. **1**, may be implemented in a variety of different ways, on one or more computer hardware platforms connected to 10 gateway devices via a wide area network. FIG. **4** depicts an example wherein the implementation is on Internet or other wide area IP network **99**. The example uses a distributed processing approach, in which the elements/platforms implementing the service management center are interconnected for communication and for wide area communication, and in this way, those elements form a network **50** for implementing the service management center.

[0104] As shown in FIG. **4**, the service management center network, through the logical capabilities earlier depicted in FIG. **4** as the ASM module of the ASD Platform at the AS Layer, manages application services for a number of gateway devices **10**, $\mathbf{10}_1$. . . $\mathbf{10}_n$ located at various users' premises. These application services, shown as ASL and ASE in FIG. **1**, implement their functionality within the Application Services Layer (FIG. **1**), through programming that resides, at least in part, within the Application Service Provider Managed Applications and Platform of the UNA-DA (FIG. **2**). As shown in FIG. **4**, secure connectivity to the service management center network **50** is provided, in one embodiment, via a WAN Termination interface, such as Ethernet WAN **53** over a broadband connection via the public Internet **99**, or, for example, via a wireless EvDO (Evolution Data Optimized) Internet data interface embodied as a PCMCIA (personal computer memory) wireless card **56**. When the WAN Termination interface **53** is used, for example, it may provide connectivity to a broadband modem serving as the NSP-TA of FIG. **2**, either as a separate unit or on a board included within the gateway device **10**. If the wireless WAN interface is used, there may be no physical NSP-TA device, and the logic of the gateway device would implement functions of the NSP-TA as well.

[0105] As will be described in greater detail herein below, the service management center **50** generally provides a communications and processing infrastructure for supporting the variety of application services and related communications residing at the gateway devices **10**, $\mathbf{10}_1$ . . . $\mathbf{10}_n$. In an exemplary embodiment, this infrastructure may be configured to provide a secure environment and may be IP-based. Preferably, this support architecture is designed for high availability, redundancy, and cost-effective scaling.

[0106] The secure platform for building and providing multiple application services for digital endpoints associated with a gateway device requires connectivity between the gateway device **10** and each of a user's devices (referred interchangeably herein as "endpoint devices" or "digital endpoint devices"). This connectivity may be provided by implementation of one or more USB ports (interfaces) **13**, a wired Local Area Network connection such as provided by an Ethernet local area network (LAN) interface **16**, or, a wireless network interface via a WiFi LAN access point **62** provided, for example, in accordance with the I.E.E.E. 802.11 b/g/n wireless or wireless network communications standard. These physical interfaces provide the required network interconnectivity for the endpoint devices to connect to the multiple application services. Although not shown in FIG. **4**, this connectivity between digital endpoint devices and the gateway device may be accomplished by other means, including, by way of example, through of a virtual private area network connection accessed through a WAN interface.

[0107] That is, the gateway device **10** interfaces with digital endpoint devices including, but not limited to: a home automation networking device **20** (e.g. X10, Z-Wave or ZigBee) for wired or wireless home network automation and control of networked home devices such as a switch controller **22**, sensor devices **23**, automatically controlled window blinds **24**, a controlled lighting or lamp unit **25** etc, individual or wired or wireless network of personal computing (PC) and laptop/mobile devices **30***a*, . . . , **30***c* that serve as file sources, control points and hosts for various other client endpoints, one or more television display devices **32** including associated set top boxes (STB) **35***a* or digital media adapters (DMA) **35***b*, one or more VoIP phone devices (e.g. SIP phones) **40**, or other devices (not shown) that convert IP interfaces to PSTN FXO and FXS interfaces.

[0108] As noted earlier, the gateway device **10** may provide an interface **35***b* to the Digital Media Adapter (DMA) for television (TV) **32**, which enables bidirectional wireline or wireless communication. This interface supports several functions for multiple services including, but not limited to: media (e.g., video and music) by enabling the transfer of media (e.g., video and music) to the TV; voice services, by providing for Called Line ID and for voice mail control; and provide Home Automation Services including status and control of networked home automation devices. The DMA element **35***b* converts audio and video (optionally) to a format suitable for a TV. In addition, the Digital Media Adapter **35***b* may be capable of receiving context-sensitive commands from a remote control device (not shown) and forwarding those commands to the gateway device **10**. This enables the use of menus on the TV **32** for controlling application services and various features functions thereof, as offered by the gateway device **10**. For example, the Media Adapter/TV combination is able to provide the following features including, but not limited to: display of media; media control functions, when enabled (FF, REW, STOP, PAUSE, etc); display of Calling Line Identification (CLID); control of voicemail; picture viewing; control of home automation; and user functions for the gateway device **10**.

[0109] A Set Top Box **35***a* as shown in FIG. **4** also may handle media format conversion (for example NTSC to ATSC television RF signals), digital decryption and other DRM (digital rights management) functions; and Video On

Demand Purchases, etc. The Set Top Box/TV combination may thus enable, by way of example: Media format conversion (for example NTSC to ATSC); decryption; other DRM functions (such as expiry of leases), prohibition of copying to digital outputs, function restriction, etc.; Video On Demand Purchases; and media control functions (e.g., FF, REW, STOP, PAUSE, etc.).

[0110] Whether provided by the DMA interface **35***b* and the TV **32** or by the set-top-box **35***a* and the TV **32**, the communications to and from the TV provide a user interface for interaction with the gateway device **10**. The programming of the gateway device supports, among other things, a graphical user interface (GUI) via the TV, sometimes referred to as the "ten-foot" interface.

[0111] With respect to PCs interfacing with the gateway device **10**, PCs may serve as, among other things, file sources, control points and hosts for various software clients. Thus, the PC programming may work in conjunction with the ASL and ASE programming of the gateway device. Together, the PC programming and the ASL and ASE programming provide a more comprehensive and robust user experience: The gateway'device **10** may further provide a bidirectional wireline or wireless interface **35***c* to a PC device **30***b* for supporting the transfer of media (e.g., video and music) to the computer for storage and viewing; for supporting voice services, e.g., by providing for calls from SIP soft clients; for file sharing, file back-up and home storage and home automation control functions. The access point **62** offers wireless data communications with a PC **30***c*. The gateway device interface through any PC may provide for the bidirectional moving of files, and status and control for the endpoint devices, including for example, status and control of networked home automation devices. In addition, using the PC interface, users may, for example, share files on the gateway devices, back-up or transfer files to the gateway devices or other storage; access personal page for notifications, RSS, shared photos, voicemail, etc. In addition to the IM and SIP capabilities of the gateway device, as described more below, PCs may also serve as a host for IM and SIP soft phone clients and other client devices. The client-server interaction of the PC with the application service logic of the gateway device **10** offers an alternative GUI for at least some of the services. The PC based GUI is sometimes referred to as the "two-foot" interface.

[0112] Although not shown in FIG. **4**, other digital endpoint devices for which connectivity may be established with the gateway device **10** include, but are not limited to: personal music or media players, hi-fi audio equipment with media streaming capability, game stations, Internet radio devices, WiFi phones, WiFi or other wirelessly enabled digital cameras, facsimile machines, electronic picture frames, health monitors (sensor and monitoring devices), etc.

[0113] As described in greater detail herein, the gateway device **10** includes both a hardware and software infrastructure that enables a bridging of the WAN and LAN networks, e.g. a proxy function, such that control of any digital endpoint device at the premises from the same or remote location is possible via the gateway device **10** using, optionally, a secure peer and presence type messaging infrastructure or other communications protocols, e.g. HTTPS. For example, via any IM—capable device or client **80***a*, **80***b* respectively connected with an Instant Messaging (IM) or XMPP (Extensible Messaging and Presence Protocol) network messaging infrastructure, e.g. IM networks **99***a*; **99***b* such as provided by Yahoo, Microsoft (MSN), Skype, America Online, ICQ, and the like, shown for purposes of illustration in FIG. **4**, a user may access any type of functionality at a subordinate digital endpoint device at the premises via the gateway device **10** and service management center **50** by simple use of peer and presence messaging protocols. In one exemplary embodiment, a peer and presence communications protocol may be used such as Jabber and/or XMPP. Particularly, Jabber is a set of streaming XML protocols and technologies that enable any two entities on the Internet to exchange messages, presence, and other structured information in close to real time. The Internet Engineering Task Force (IETF) has formalized the core XML streaming protocols as an approved instant messaging and presence technology under the name of XMPP (Extensible Messaging and Presence Protocol), the XMPP specifications of which are incorporated by reference herein as IETF RFC 3920 and RFC 3921. Thus, the gateway device is provided with functionality for enabling a user to remotely tap into and initiate functionality of a digital endpoint device or application at the premises via the IM-based messaging framework. In addition, the gateway device **10** and network connectivity to the novel service management center **50**, provides, in a preferred embodiment, a secure peer and presence messaging framework, enabling real-time communications among peers via other gateway devices **10**$_1$ . . . **10**$_n$. For instance, the device **10** provides the ability to construct communication paths between peers with formal communications exchanges available between, for example, one gateway device **10**, at a first premises and a second gateway device **10**$_n$ located at the remote premises. Thus, such an infrastructure provides for content addressing, enabling peers through remote gateway devices **10**$_1$ . . . **10**$_n$, to supply and request content such as files, media content or other resources of interest to a community of interest.

[0114] As noted above, the novel system architecture allocates the logical functionality of the ASD Platform (FIG. **1**) between the gateway device **10** and the service management center **50** within an environment that enables communication and feedback at the AS Layer (FIG. **1**) between the gateway device **10** and service management center **50**. Thus, the gateway device **10**, when operable with the service management center **50**, makes possible the management of services for the digital home and facilitates the easy addition of new services or modification of existing services. Such services may include, for example, facility management (home automation), media content downloading and Digital Rights Management (DRM), device updates, data backups, file sharing, media downloading and transmission, etc., without the intermediary of a plurality of external service providers who may typically provide these individual services for every digital endpoint device in the home or premises. The programming for these services resides in the Application Service Provider Managed Applications and Platform of the UNA-DA (FIG. **2**). That is, as earlier shown, the gateway device **10** is integrated with hardware and software modules and respective interfaces that handle all aspects of home automation and digital endpoint service and management for the home in a manner without having to rely on external service providers and, in a manner that is essentially seamless to the user. This, advantageously is provided by the service management center **50** which is able to access regions of the gateway device **10** that are not accessible to the user, e.g. for controlling the transport and storing of digital content and downloading and enabling service applications and upgrades and providing largely invisible support for many tasks performed by users.

[0115] For example, with the robust capabilities of the Application Service Provider Managed Applications and Platform (FIG. **2**), the gateway device **10** is capable of handling all aspects of the digital home communications, e.g. IP, voice, VoIP, phone connectivity. In this example, the service logic located and stored at the gateway device **10** may provide soft-switch functionality for implementing call-processing features at the premises (rather than the network) for voice communications, and enabling management of other service features to be described. With the provision of central office type call services and other service features provided at the gateway devices $\mathbf{10}_1 \ldots \mathbf{10}_n$, a distributed soft-switch architecture is built. The ASM logical functionality of the service management center **50**, in cooperation with the ASE logical functionality of the gateway device, may, among other things, provide, manage and regulate, for example, service subscription/registration, authentication/verification, key management, and billing aspects of service provision, etc. With all of the service logic and intelligence residing at the gateway device, a service provider can offer customers a broad spectrum of services including, but not limited to: media services, voice services, e.g. VoIP, automated file backup services, file sharing, digital photo management and sharing, gaming, parental controls, home networking, and other features and functions within the home or premises (e.g. home monitoring and control). Users can access their content and many of the solution's features remotely. Moreover, software updates for the in-home devices that require updating are handled in an automated fashion by the system infrastructure. The service management center infrastructure additionally provides a web interface for third-party service providers to round out the service solutions provided at the gateway device for the premises. For example, a third-party service provider other than the managed service provider associated with the service management center may be allowed access through the infrastructure to particular endpoint devices to provide additional services such trouble shooting, repair and update services.

[0116] For the in-home services, the multi-services gateway device **10** connects the various service delivery elements together for enabling the user to experience a connected digital home, where information from one source (for example, voicemail) can be viewed and acted on at another endpoint (for example, the TV **32**). The multi-services gateway device **10** thus hosts the various in-home device interfaces, and facilitates the moving of information from one point to another. Some of the in-home endpoint device processing duties performed by the gateway device **10** include, but are not limited to: 1) detecting new devices and provide IP addresses dynamically or statically; 2) functioning as a (Network Address Translator) NAT, Router and Firewall; 3) providing a centralized disk storage in the home; 4) obtaining configuration files from the service management center and configuring all in-home devices; 5) acting as a Registrar for SIP-based devices; 6) receiving calls from and delivering calls to voice devices; providing voicemail services; 7) decrypting and securely streaming media having digital rights management (DRM) encoding; 8) distributing media to an appropriate in-home device; 9) compressing and encrypting files for network back-up; 10) backing-up files to the network directly from gateway device; 11) handling home automation schedules and changes in status; 12) providing in-home personal web-based portals for each user; 13) providing Parental Control Services (e.g. URL filtering, etc.); 14) creating and transmitting billing records of in-home devices including, recording and uploading multi-service billing event records; 15) distributing a PC client to PCs in the home, used in support of the various services such as monitoring events or diagnostic agents; 16) storing and presenting games that users and buddies can play; 17) delivering context-sensitive advertising to the endpoint device; and, 18) delivering notifications to the endpoint device; and, 19) enabling remote access through the web, IM client, etc. Other duties the gateway device **10** may perform include: service maintenance features such as setting and reporting of alarms and statistics for aggregation; perform accessibility testing; notify a registration server (and Location server) of the ports it is "listening" on; utilize IM or like peer and presence communications protocol information for call processing and file sharing services; receive provisioning information via the registration server; utilize a SIP directory server to make/receive calls via the SBC network element to/from the PSTN and other gateway device devices; and download DRM and non-DRM based content and facilitating the DRM key exchanges with media endpoints.

[0117] While the gateway devices **10** as described above are each equipped with various logic and intelligence for service features that enable the gateway devices to provide various integrated digital services to the premises, as described herein with respect to FIG. **3**, the network-based elements of the service management center **50** supports and manages multi-services gateway devices, for instance, so as to control the accessibility to functionalities and service features provisioned in the gateway devices and the ability to communicate with other gateway devices and various digital endpoint devices connected thereto. These elements that support and manage the gateway devices **10** comprise the ASM module described above with reference to FIG. **1**. These ASM elements may, for example, provide the necessary data to the ASE and ASL modules so that they may carry out their respective functions, oversee the overall integration and communication among all the modules and the services that are managed by the ASM, manages the overall security and integrity of the ASD, and maintains alarm, statistical, subscription and provisioning data, and data necessary for the integration of services from third-party service providers, e.g., media content aggregators.

[0118] Examples of various ASM functionalities performed at the service management center **50**, from the Service Provider Network regime, include but are not limited to: service initialization of the gateway devices, providing security for the gateway devices and the network support infrastructure, enabling real time secure access and control to and from the gateway devices, distributing updates and new service options to the gateway devices, providing service access to and from the gateway devices and remote access to the gateway devices, but not limited to such. In support of these services, the service management center **50** provides the following additional services and features: authentication; multi-service registration; subscription control; service authorization; alarm management; remote diagnostic support; billing collection and management; web services access; remote access to gateway devices (e.g. via SIP or Internet/web based communications); reachability to access challenged gateway devices; software updates; service data distribution; location service for all services; SIP VoIP service; media services; backup services; sharing services; provisioning; gateway interfaces to other service providers (Northbound and peering); load balancing; privacy; security; and network protection.

[0119] The logical network architecture for the service management center network **50** delivering these capabilities is illustrated and described in greater detail in U.S. Provisional Application No. 60/882,865 Filed Dec. 29, 2006 entitled "A MULTI-SERVICES APPLICATION GATEWAY AND SYSTEM EMPLOYING THE SAME," and of U.S. Provisional Application No. 60/882,862 Filed Dec. 29, 2006 entitled "SYSTEM AND METHOD FOR PROVIDING NETWORK SUPPORT SERVICES AND PREMISE GATEWAY SUPPORT INFRASTRUCTURE;" and the disclosures of the service management center network and its operations from those applications are entirely incorporated herein by reference.

[0120] With the gateway architecture implementing the Application Service Provider Demarcation (e.g. FIG. **2** and FIGS. **3A-3C**), the demarcation in accessibility to hardware resources of the gateway device **10** delineates a portion of the storage accessible by a user via an endpoint device from an application service provider portion of the storage containing the application service programming and/or data of the application service provider. For example, the user of an associated endpoint device may be able to store and retrieve data files in the user accessible portion of the storage of the gateway device **10**. The application service provider, in turn, can control storage and retrieval of data files in the application service provider portion via the of the wide area network as well as installation and configuration of various software/firmware logic modules. However, as outlined above, the user access to the logic and resources between the two demarcations is limited. The application service programming only provides a logical application service interface. across the Applications Service Provider Demarcation, for delivery of one or more application services to an endpoint device. The user can obtain and use the application service and its features but can not access the underlying application service logic or its configuration data. For example, the user of the associated endpoint device is prevented from accessing one or more of the data files in the application service provider portion of the storage media. For some service applications, the application service provider can allow storage and retrieval of data files in the application service provider portion via the wide area network, for other gateway devices. Also, the logical location of the demarcation line separating the portions of the storage is controllable by the application service provider, from the service management center **50**, via the wide area network **99** and the second interface. To illustrate these points, it may be helpful to consider some examples.

[0121] FIG. **5**A conceptually depicts the logical demarcation in a storage media, between a portion thereof accessible by the user and a portion thereof that is accessible and controlled by the application service provider. In the example, the delineation provides isolation of downloaded service logic and associated data for implementing services from service provider and/or downloaded content from a user generated content.

[0122] As shown in FIG. **5**A, the gateway device **10** includes functionality for logically combining the storage available from its own internal and attached hard drive(s) **154**, with any Network Attached Storage (NAS) device **158** available via the wide area network to create a single virtual file system that consumers can use like a single drive. The gateway device **10** will automatically detect, mount and manage the connections to the NAS devices and add them to its own file system. Users of the gateway device **10** are thus presented with a single consolidated storage device that they can access just like another drive on their PC. Users will not be exposed to the underlying protocols and management features required to provide such a feature. Users no longer have to use each of the storage devices separately.

[0123] However, as further shown in FIG. **5**A, a virtual demarcation **155** is enforced at the centralized disc storage device **154** of the gateway device **10**, e.g., which may comprise one or more physical hard drives. The demarcation **155** is essentially the extension of the Application Service Provider Demarcation (FIG. **2**) that extends through the gateway storage **154**. With respect to the storage **154**, the virtual demarcation **155** physically and logically isolates the storage partition or portion **156** where service logic and associated data for implementing services from the application service provider and/or downloaded media content controlled by that service provider are stored, from another partition or portion **157** where user generated data, e.g., user files, is stored. Thus, the portion **156** of storage **154** belongs to the application service provider and is accessible by the service management center **50**. The application service provider can use the portion **156** for receiving logic and intelligence for the device **10**, and backed-up user files, all of which is managed by the service control center **50** and enforced locally at the ASE logic in the gateway device **10**. However, the other portion **157** of storage **154** is storage that is user accessible and includes a user accessible graphic user interface (GUI) which may be accessed by a digital endpoint device, e.g., a PC, programmed to enable visibility if granted to the user. Thus, the user is enabled to skew the demarcation point depending upon the amount of control granted or authorized to the user according to subscribed features and service configurations. However, the demarcation location is controlled by the application service provider. This separation within the gateway device **10** is an enabler for delivery of the service logic that resides on the device on the network side of the virtual demarcation. That is, the service provider offers all of its services upstream of this demarcation point; and the customer can choose which service is selected that is within the control of the service provider's network.

[0124] While the service center **50** is responsible for placement of service modules and data beyond the demarcation **155**, the gateway device **10** is equipped with certain functional elements such as encryption techniques, local directory obfuscation techniques and local enforcement to prevent user visibility beyond the demarcation **155** that belongs to the service provider unless the user is enabled with such visibility. The intelligence and service logic that is on the gateway device **10** is managed by the service center **50** and provides the logic to limit user access.

[0125] FIG. **5**B illustrates the virtual demarcation **155** within storage **154** of the gateway device **10** located on the customer premises, and this drawings provides examples of how the location of the demarcation **155** is moveable. The logic allows the customer to skew the location of the demarcation, albeit, within limits enforced by the logic managed by the application service provider. The provider also can adjust the location of the demarcation within the storage **154** on gateway device **10**. The demarcation within this device can occur on a physical storage medium, e.g., a hard disk drive **154** that has been sectored for different users, or in a virtual memory location, e.g. locations **155***a,* **155***b* or **155***c,* based on the service levels being offered, e.g. service A, service B or service C, respectively. This approach allows the customer more flexibility in manipulating the service rendered and services offered by the provider. By allowing the demarcation closer to the customer this allows more control of features from the customer and allows the service provider closer control of the customer infrastructure without owning it all. Thus, with this device in place, the new demarcation moves based on the service.

[0126] For an example of demarcation control, if some data is required to be stored, e.g., a downloaded movie, the customer can store it locally, securely locally, or securely remotely. While it is the customer's responsibility to do storage locally and securely locally, with the virtual demarcation, the service of providing locally secure data is now part of an offering of the service provider. While the data is still on site, the data is under control of the service provider and follows service agreements for that storage of data.

[0127] As another example of demarcation control, movies may be downloaded and stored at the service provider's side beyond the demarcation **155**, as requested by a user via a user interface through a device connected to the device. This user interface, enabled via the user side of the Application Service Provider Demarcation of the gateway device **10**, is accessed through a PC, a TV, cell phone. After authentication, the user could select and prioritize movies to purchase for example, in compliance with the media content service provider. The choice of interfaces and amount of visibility by endpoint devices accessing this user interface may be optimally designed from a contention standpoint from the perspective of controls, security, network service control manageability, and cost. A selected movie is downloaded to the service center's portion **156** of the storage **154** as shown in FIG. **5**A. Unless and until the user has purchased the movie for playback via an authentication process, that user will be prevented from accessing the content. Otherwise, the user may initiate streaming of the content directly to a digital endpoint device, e.g., a television, or will be granted permissions to download and play the movie according to the subscription with the media content provider as managed by the gateway device. If the user has purchased the movie, the movie may be transferred physically to the user storage portion **157** of the storage **154**. Otherwise, the content may be temporarily copied, for local storage by the user at the user accessible portion of the demarcation point for playback at the user endpoint device.

[0128] Another example of demarcation control is the manipulation of features for a given service. Currently a subscription order is processed, and these features are manipulated within the service provider's network and sent down to the customer for provisional changes to equipment at the service center's side of the demarcation point. The location of the demarcation can be adjusted to meet storage space needs on either or both sides, as needed for various services offered to this user or even services provided to other users. Via a GUI established for the endpoint device when connected with the gateway device **10**, when authenticated, files may be unlocked so the customer may locally manipulate services before and after the Application Service Provider Demarcation, thereby virtually shifting the point or location of the demarcation. Thus, a virtual demarcation allows the application service provider flexibility in offering different services and features. Examples of relevant services include, but are not limited to services such as: parental control, advertisement monitoring and replacement, home user habit monitoring, home channel monitoring, and back-up services.

[0129] In one service example, the gateway device **10** and service management center **50** provide a file management feature generally including functionality that enables a user to back-up files or content to a virtual memory storage area provided in the gateway device **10**, and then subsequently forward the backed-up files to an external wholesale service provider providing the backup service. Thus, gateway storage device **10** provides the protected storage for user files and user content at its side of the demarcation point in a two-stage storage process: 1) storing the content across the virtual demarcation point (partition); and then, encrypting the content; and, 2) dispersing the stored content to other gateway devices, or at another storage location provided by the service center or by a partnered third party back-up storage service provider. This could be performed automatically; on a scheduled basis, or on demand as requested by a user. The gateway device **10** knows where the data portions will be stored, based on the service configuration and subscription. Backup may be on a central host operated by the application service provider; or in an implementation discussed more below, the backup files and/or portions thereof may actually reside in the service provider's portion of storage in other gateway devices. The locations of devices that may back up content pieces are known at the network level, e.g., hardware IDs of each of the other gateway devices are known based on the unique identity of the device, and the mappings of the IP addresses of the devices that change dynamically are known at location servers provided by the service management center **50**, so the location of backed-up content for a user is always known.

[0130] In a further aspect of the file-sharing service, the gateway device **10** and service management center **50** may provide a hosted service-virtual space on the centralized disk storage at the gateway device for users. Dedicated areas of user storage may be designated as sharable—including application level sharing for any application that has data. As shown in FIG. **6**, this virtual storage area **159** may be combined from its internal hard disc storage with any network attached storage device located at the network to create a singe virtual file system that consumers can use like a single drive.

[0131] FIG. **7** depicts basic steps of an overall process **800** for back-up file services using a third party storage provider according to certain aspects. As shown, in a first step **801**, the device has been programmed to initiate an automatic back-up process at the PC endpoint. Then, at step **803**, the files to be stored from a user device, e.g., a PC, are first compressed, encrypted and transferred to the gateway device **10**. Referring back to FIG. **5**A, this service may be configured to automatically implement a transfer **158** of user data or files from an attached user controlled portion **157** of storage **154** to be backed-up. Optionally, the gateway device **10** may compress and encrypt the data. After any such processing, the transferred data or files are stored at the application service provider side **156** of the virtual demarcation **155** (the encrypted partition) where the service management center **50** has visibility. Then, the device File Manager module of the gateway device **10** starts the Backup Manager module, which performs the File Backup to a Data Center which may be implemented as part of the service management center **50**. A Backup Manager functionality in the service management center **50** checks to see if the user is subscribed, and if so, proceeds to create an index of backup data and obtain an access key from the backup service provider **96**, as indicated at step **806**. Once authorized, the back-up service key is provided to the user's gateway device **10** at step **807**. Then, in stage **2** of the back-up process, as indicated at step **810**, the backed-up files are transferred with the service key to the third party storage provider **96** via the wide area network. Then, once successfully stored at the third party back-up storage service provider **96**, a positive acknowledgement is communicated from the service provider to the gateway device **10** as indicated at step **812**.

[0132] As controlled by the management service center **50**, in an alternate embodiment, the encrypted content to be stored is transmitted to at least one other gateway device **10**, for storage at a location **156** beyond the respective demarcation **155** for service provider storage in the storage **154** of the other gateway device(s). If multiple other gateway devices **10** are used for this service, the user's data or files can be back-up in a distributed, safe and redundant manner on the provider's storage portion **156** of the other devices **10**. That is, each file may be partitioned into a plurality of pieces for further transfer or storage in a redundant and secure manner, e.g., and transferred to the service provider portions **156** behind the virtual demarcations **155**. These pieces may then be encrypted and sent out externally for further storage, automatically, e.g., at time of log-in, on a scheduled basis, or, upon user initiation.

[0133] Before describing FIG. **8**, some definitions are provided with respect to certain terms as they relate to peer to peer systems. A "zone" is considered an addressable space, often associated with a node, which represents the ID of the node for the purposes of a file distribution method. A "neighbor zone" is a peer node to a specific zone, or node, with the specific zone maintaining state about the neighbor zone. A "neighbor area" consists of a number of neighbor zones. The neighbor area may be defined by the coordinates of the overlay network.

[0134] FIG. **8** illustrates an exemplary process demonstrating the "peer-to-peer" file backup in which files are backed up on different gateway devices **10**. For purposes of explanation with respect to this figure, the different gateway devices **10** will be referred to as Appliance1 and Appliance2 respectively. At **1802**, Appliance1 determines backup files and may save the files on the Appliance1. At **1804**, Appliance1 creates a backup file label. Such a backup file label may be, for example, a label associated with a backup file. At **1806**, Appliance1 hashes the backup file label to generate backup file id. At **1808**, Appliance1 routes a backup request with address backup file id to a peer-to peer node, e.g., Appliance2, whose zone covers the backup file id. This routing to another gateway device **10**, in this case Appliance2, in certain embodiments, uses the gateway-to-gateway peer-to-peer communication mechanism described above. At **1810**, Appliance2 determines available backup space over its neighbor zones. This determination may also be performed by the Appliance2 querying the gateway devices in its neighboring zones using the gateway-to-gateway peer-to-peer communication mechanism described above. At **1812**, Appliance2 receives reports of disk availability from other gateway devices in its neighbor zones. At **1814**, Appliance1 receives IP addresses of gateway devices with available storage space in the neighbor zones of Appliance2. At **1816**, if space reservation is not successful, steps **1804** to **1814** may be repeated to reserve storage for backup in other gateway devices (appliances). At **1818**, if space reservation is successful, Appliance1 encrypts the backup file. In certain embodiments, Appliance1 breaks up the backup file into n blocks at **1820**. At **1822**, Appliance1 generates n+m blocks of erasure codes. In general, an erasure code transforms a message of n blocks into a message with greater than n blocks such that the original message can be recovered from a subset of those blocks. At **1824**, Appliance1 transfers, for example using the secure gateway-to-gateway peer-to-peer communication mechanism described above, the blocks to n+m gateway devices (appliances), that is, those determined to have storage space available, for example, those gateway devices in the neighboring zones of Appliance2. In certain embodiments, different blocks may be transferred to different gateway devices. Further, each block may be stored redundantly, for example, on more than one gateway device. At **1826**, information associated with this backup, for example, Appliance1's id, backup file label, and area boundary coordinates of Appliance2 and IP addresses of the gateway devices that have storage space available for backup may be reported to the support network.

[0135] FIG. **9** illustrates an exemplary processing for restoring files backed up using the method described with reference to FIG. **8** in certain embodiments. Again, for purposes of explanation with respect to this figure, the different gateway devices **10** will be referred to as appliances. At **1852**, Appliance1 determines the backup file label associated with a file being restored and area boundary associated with the gateway appliances storing the file. At **1854**, Appliance1 hashes backup file label and generates backup file id. At **1856**, Appliance1 routes, for example, via peer-to-peer communication as described above with respect to gateway-to-gateway communication, a retrieval request with address backup file id and area coordinates to another gateway node, Appliance3, whose zone covers backup file id. In certain embodiments, Appliance3 need not be the same Appliance2 described in FIG. **8**, although it can be in certain embodiments. At **1858**, Appliance3 transmits a retrieval inquiry over neighbor gateway devices (appliances) within the area coordinates. At **1860** the gateway devices (appliances) in Appliance3's neighbor or area zone report whether they have one or more file blocks associated with backup file id. At **1862**, Appliance3 reports IP addresses of the appliances holding file blocks associated with backup file id. At **1864**, Appliance1 fetches the blocks from those gateway devices storing the file blocks, decodes erasure codes into a file at **1866**, and decrypts the file at **1868**. At **1870**, Appliance1 may inform a user that file restore has completed successfully. At **1872**, old backup file blocks may be cleared.

[0136] Hence, the gateway device **10** interoperates with the network support to provide data backup and restore services. For instance, the gateway device **10** may include a user interface and application or like functionality for allowing users to select files, for example, stored on a user's PC, on the gateway device **10** or other endpoint devices for the backup and restore services. The term "file" as used herein comprehensively refers to files, folders, directories, any data in any format, for example, media, ASCII, etc. The gateway device **10**, as discussed above, may encrypt and compress, and transfer the files to a backup storage. In certain embodiments, the backup storage is a storage provided by the remote third party backup service data center **96**. In such embodiments, data is backed up to and restored from the backup service data center **96**, for instance, via interoperating with the support network, which for example, interfaces to the remote third party backup service data center **96**. In certain other embodiments, this backup storage may be at the gateway device **10** itself, for instance, on the non-user accessible region of the gateway device storage that is only accessible by the services support network, as discussed earlier. Yet in other embodiments, files are backed up in a distributed manner on the non-user accessible region of other gateway devices **10**, for example, which may reside at other premises. For instance, a file may be divided into multiple parts and each part may be backed up on different gateway devices. Further, one or more parts may be backed up redundantly, that is, on multiple gateway devices **10**. Combinations of any of the above-described embodiments may be utilized for backup and restore services. In certain embodiments, a user may provision and subscribe to the type of backup services desired with the provisioning and/or subscription service as described above.

[0137] It should be understood that in addition to backing up files originating from endpoint devices, the disclosed systems and methods back up files from the gateway device **10** itself, including non-user files. Such files may include, but are not limited to, configuration files, service files, billing files, as well as files that the gateway device **10** is backing up that came from other gateways. In other words, all of the files of the gateway device **10** can be backed up, to a central storage location or in a distributed manner to other gateway devices **10**. This redundancy in backing up files allows for easy replacement or restoration of a gateway device **10** at a premises, which can be catastrophically damaged, by fire for example. As all, or some selected portion of the files of the gateway device **10** are backed up, centrally or in a distributed fashion, it becomes relatively simple to restore the files to the gateway device **10** or to a new gateway device **10**, by pulling the backed up files from the central storage location or the distributed storage locations (e.g., other gateway devices **10**). Since the backing up of the gateway device **10** files involves files of which the user may not even be aware, the backing up of the gateway device **10** may be made automatic, on a scheduled basis, or on demand from the service management center **50**, or on demand from the user.

[0138] It is understood that, in connection with the implementation of backup services provided by partnered third party providers, for example, the gateway device is configured to communicate with the backup file service provider **96** via the web interface and thus requires the URL of the service provider **96** for where the gateway device **10** should communicate. Configuration data is provided to the gateway device **10** from the subscription manager as part of the initialization process, that queries the service providers **96** to obtain configuration data that can be sent back to the gateway device, and determine which versions from a configuration perspective to report back to the gateway device. For backup services this may be a version **1** at URL **1** so the gateway device **10** should go to this location or, based on the location of the gateway device **10** may be sent to URL **2**. For each service, configuration data is provided to the gateway device **10**. This is all based on handshaked communications. When the user invokes the service, the gateway device **10** knows all that it needs to invoke the service.

[0139] The file backup service involves file management. To receive file backup service, a user will typically be required to subscribe to such a service. The file backup service can be charged, for example, based on used storage space in the data center, on a monthly basis. The files, which can be originally stored on the user's PC or other endpoint device, or on the gateway device at the user premises, that may be selected to be backed up into the data center (i.e., storage location) is managed by the file manager of the gateway device **10**.

[0140] FIG. **12** is a block diagram depicting certain components in an arrangement to provide file backup service. Components in this diagram that are relevant to the discussion of file backup will be discussed, while other components that are not relevant will not be described. Also, in this example, it is assumed that the file is linked up at a central storage location, such as at the backup service provider **96**. In FIG. **12**, a backup file is encrypted and compressed before it is sent to the backup service provider **96**. If the backup file originates from gateway device home storage, it will be encrypted and compressed by the backup manager **200**. If the backup file originates from a PC **30** or other endpoint device, it will be encrypted and compressed by the PC **30** or other endpoint device.

[0141] In order to restore a backed up file from a wholesale backup provider, a reversed procedure will be performed. If a restored file is sent to the gateway device home storage, the backup manager **200** of the gateway device **10** will uncompress and decrypt the file before the file is placed in a designated home storage folder **202**. If the restored file is sent to the PC **30** or other endpoint device, the PC client **30** or endpoint client will uncompress and decrypt the file after ftp from the gateway device home storage, then place the file in the designated PC folder **204** (or other endpoint device folder). These files can be accessed by a browser, for example.

[0142] The system includes a number of databases, these databases including include system level data, file data, and file backup data. For system level data, in certain embodiments, three tables are managed by the user management module (see FIG. 3B, Services Framework **120**) in the gateway device **10**. These tables are not illustrated specifically as the tables are conventional in structure, but their exemplary contents will be described below. One table may contain user information (the user information table), and contains the information of a PC user, for example, who is a gateway device user also. The same user can be registered on multiple PCs **30**. Some of the information in the user information table can include a unique id of a user, the login name of the user, and a password.

[0143] Another table is the host information table, which contains the information related to a PC **30** or other endpoint devices. This information can include the unique id of a host, the host name, a host MAC address, and online/offline status, for example. The third table may be a host user table, for example, that contains a mapping pair of a host and a user to handle multiple-to-multiple relation between user and host.

[0144] The file database has a file information table that contains metadata information of files that are backed up and/or shared. Each folder itself is a file and has a corresponding file information record in the table. For each folder level, file query is based on a folder id. A folder's file id is used as a folder id by the files that belong to this folder.

[0145] Certain gateway device home storage predefined folders are provided in the file table by default. When the user selects files for backup or sharing, if their home storage folders **202** or PC folders **204** do not have corresponding instances in the database, the new instances have to be inserted into the file information and file folder tables by a browser via a web server. Exemplary predefined folders may include: documents, games, movies, music, pictures, presentations, etc.

[0146] A folder information table provides a complete path of the storage folders of the gateway device and related PC or other endpoint device folders. The folders are used in file backup, restore and sharing.

[0147] A tag information file provides a description of a tag that will be attached to a selected file. The tag is used for flexible file searching.

[0148] The file backup data database includes a backup information table, which provides a part of the backup setting, identified with a backup name by the user and queried by a backup id internally. The user is able to select between backing up now, setting a one-time schedule for backing up, or setting a repeated backup schedule. When the user sets a schedule, an associated backup schedule information record is created.

[0149] A backup file information table contains file ids of selected files for backup. This can contain the file id, the backup id, the folder id and the status, for example.

[0150] A backup schedule information table contains backup schedule information of each scheduled backup setting, which is identified with its schedule name by the user and queried by its schedule id internally. The table contains attributes such as schedule id, schedule name, schedule type (e.g., daily, weekly, monthly), schedule day, schedule time and status.

[0151] A backup execution information table contains log information of each execution of each backup setting. Some of the attributes in the table include backup exec id, backup id, execution time, status, and error code.

[0152] The backup file detail stores backup history details. These include which files are backed up at what time with which file name in the data center at the backup service provider **96**. This table is also used by the user to select files for file restore. Some of the attributes in the table include file id, backup exec id, folder id, file size, home storage file create time, home storage file modify time, PC file create time, PC file modify time, backup time, network file name, status, and error code. When the user selects a file or folder for backup, the backup file information shall have folder id set to zero; while all files under a folder shall have their backup file information with folder id set equal to the file id of the folder.

[0153] A restore file detail table contains a history log of restores. When a file restore is executed, a new restore file detail is created to record its execution information. Some of the attributes in the table include file id, restore time, file size, backup exec id, status and error code. When the user is doing restore, the browser only displays files with folder id equal to zero, which is what the user selected when performing the backup. If the user wants to expand a folder in the list, the browser shall be able to obtain its files by using the folder id.

[0154] When a user with an endpoint device associated with a gateway device **10** adds backup service, a backup account for that gateway device **10** will be set up and secure access for the gateway device **10** to the backup service provider **96** is created. The file manager **206** and the backup manager **200** (FIG. **12**) need not be notified at this time, as no active backup set is yet defined. A backup set is also known as a backup job, or an instance of a backup, and these terms may be used interchangeably. The backup manager **200** can obtain certificate and key information later, when a backup job is started.

[0155] Upon a user cancelling backup service, a subscription manager **208** at the service management center must notify the file manager **206** to stop all existing and scheduled backup activities before closing the user's backup account.

[0156] FIG. **13** schematically depicts an exemplary subscription process. Referring also to FIG. **12**, the user employs a browser **210** through a web server **212** to send a message to subscribe to the backup service at **300**. A subscribe to the backup service message is sent from the web server to a provisioning manager **214** at the service center at step **302**. The provisioning manager **214** requests the billing manager **216** to set up an account for backup service, step **304**. The billing manager **216** then opens the account with the backup service provider **96** in step **306**. Once the account is opened, the backup service provider **96** issues an account key and/or a secret key, which is received by the service management center **50**, in step **308**. The provisioning manager **214** sends a configuration message to the backup manager **200** of the service management center **50** (step **310**), which then downloads the configuration to the gateway device **10** at step **312**.

[0157] FIG. **14** depicts an exemplary process to cancel a backup service. The user can specify a date to actually stop the service. The subscription manager **208** will stop the backup service immediately or on a specified by setting a timer. The browser **210** sends a cancel backup service subscription message via the web server **212** to the provisioning manager **214** of the service management center **50**, in steps **320** and **322**. If the service is to terminate immediately, the provisioning manager **214** sends a stop backup service message to the backup manager **200**, which sends a message to the gateway device **10** to stop the backup service (steps **324** and **326**). All backup is then stopped at the gateway device **10**, and a done signal is sent to the backup manager **200** (step **328**). A cancel account signal is provided by the backup manager **200** to the billing manager **216** after the backup manager **200** receives the done signal from the gateway device **10** (step **330**). The billing manager **200** requests and receives a last bill from the backup service provider **96** (steps **332** and **334**). The backup manager **200** sends a message to the backup service provider **96** closing the account (step **336**). If the backup service is not to terminate immediately, but at a later time, a timer is set (step **338**), at which time the provisioning manager **214** sends the stop backup service message to the backup manager **200**, with the rest of the procedure following as above described.

[0158] FIG. **15** schematically depicts an exemplary process to stop all backup service. When the cancellation of backup service becomes effective, the subscription manager **208** notifies the file manager **206**. Upon this notification, the file manager **206** stops all running of the backup and restore, and stops all scheduled backup jobs. In addition, the file manager **206** cleans up backup data in the database of the gateway device **10** and a temporary folder used for backup and restore. As seen in FIG. **15**, the file manager **206** resets backup and restore flags. For backup timers, the timer is deleted (step **340**). Temporary files to be backed up are depleted in step **342**. Backup file information is deleted in step **342**. Backup schedule information is deleted in step **346**. Backup information is deleted in step **348**. The log is deleted in step **350**.

[0159] FIG. **16** depicts an exemplary process for starting the file manager **206**, which is started (step by the platform manager (see platform manager **110** in FIG. **3***b*) during initialization of the gateway device **10**. The file manager **206** starts the backup manager **200** (step **354**), which manages file backup to the backup service provider **96**. The backup manager **200** checks with the subscription manager **208** in step

356 to determine if this gateway device **10** has subscribed for backup service or not. If the gateway device **10** has subscribed, the backup manager **200** obtains the backup certificate and/or key information (step **358**). When the file manager **206** starts, it performs a number of initialization activities, including finding incomplete backup jobs that started before the file manager **206** restarted, and continues these incomplete backup jobs until complete (step **360**). The file manager **206** also finds incomplete restore jobs and continues them until complete (step **362**). Further, the file manager **206** initializes timers for all scheduled backup settings (step **364**). The file manager **206** queries the database for a backup schedule (step **366**) and receives the backup schedule (step **368**) The file manager **206** also processes timeouts (step **370**).

[0160] FIG. **17** depicts an exemplary process to create a backup set. To backup files, the user creates a backup set (or "backup job") using the browser **210** through the web server **212** (step **380**). This causes a backup information instance to be inserted into the database of the gateway device **10** by the browser **210** (step **382**). The database provides a backup id to the web server **212** (step **384**) The user then selects files for the created backup set (step **386**). The files included in the backup set will be backed up when the backup set is executed. Three backup modes include: backup now (step **388**), one-time schedule, and repeated schedule (steps **390**, **392** and **400**). In the scheduled modes, the backup schedule information is inserted in the database interface (step **398**) and a set timer signal is sent by the file manager **206** to the timer manager (step **402**).

[0161] FIG. **18** depicts an exemplary process to add a backup file. If a single file is to be added, the browser **210** sends an add backup file message to the web server **212** (step **404**). If there is no file information, the web server **212** inserts file information into the data base in step **406**. Backup tile information is inserted into the database in step **408**. Similar steps are performed for folders with multiple files, in steps **410-416**.

[0162] FIG. **19** depicts the modifying of a backup set and FIG. **20** depicts the process of deleting a backup file. The user can modify a backup set by adding and deleting backup files to and from the backup set (step **420**), and by changing the backup schedule (step **422**) and/or the backup mode. The adding of the backup file is as depicted in FIG. **18**, while deleting a backup file is performed as depicted in FIG. **20**. The browser **210** inserts or deletes corresponding backup file information and updates backup schedule information as needed.

[0163] FIG. **20** depicts an exemplary process to delete a backup file. The browser **210** deletes backup file information and updates backup schedule information (steps **424** and **426**). This process is performed for a single file or for multiple files and folders.

[0164] A first mode of backup is the backup now mode, an exemplary process being depicted in FIG. **21**. After setting a new backup set or selecting an existing backup set (such as in FIG. **19**), the user is able to select "backup now" to immediately activate a backup action. This triggers the browser **210** to update the relevant file information status to backup and sends a backup now message (step **430**) to the file manager **206**. The file manager **206** retrieves file information from the database based on their status, in steps **432-438**. When the file manager **206** has more backup file information, a backup one file procedure is performed (step **440**), an exemplary process being show in FIG. **22**.

[0165] To make the backup function more efficient, the file manager only backs up those files that have been changed since the last backup was performed. FIG. **22** depicts the backup of one file. The file manager **206** compares the real file time stamp with its corresponding file information time stamp (step **442**). If the file information time stamp is older than the real file, that means this file has been changed and needs to be backed up. If the backup file is a home storage (HS) file, the file manager **206** directly requests the backup manager **200** to back the file up to the backup service provider **96** (step **450**). If the backup file is a PC file, the file manager **206** sends an "ftp from PC to HS" request to the PC client **30** (step **452**). After the file is copied to the home storage, the file manager **206** will request the backup manager **200** to back up the file to the backup service provider **96**.

[0166] As depicted in FIG. **23**, a scheduled backup is triggered by a timer, at the gateway device **10**, for example, or at the endpoint device. If there is an ongoing execution of the same backup set as the scheduled backup set, the scheduled backup set is delayed until the current execution of the backup set is finished (Hold). The file manager **206** provides a process timeout signal to the timer manager (step **460**). If there is no existing scheduled backup of the current backup set, then a timeout handler is requested by the file manager **206** to the timer manager and the timer (steps **462** and **464**). The timer manager sends a handle timeout signal to the file manager (step **466**) which initiates the backup now process of FIG. **21** in step **468**.

[0167] FIGS. **24*a-d*** show exemplary procedures for restoring backed up files from a backup service provider to a user's gateway device **10** or to an endpoint device, such as a PC **30**. Referring now to FIG. **24*a***, to perform a file restore, the user selects a backed up file from a backupfiledetail list, and provides the request to restore the file in step **500** with the browser **210** via the web server **212** to the file manager **206**: The user specifies a restore location. As examples, the restore location can be the original location of the file, or a different location or folder. There are two different types of restores, either a home storage file restore (step **502**, shown in more detail in FIG. **24*b***) or a PC file restore (step **504**, shown in more detail in FIG. **24*c***). In both of the different types of restore, a restore file from backup service provider **96** step **506** is provided, corresponding to the procedure depicted in FIG. **24*d***.

[0168] In FIG. **24*b***, the restore file from backup service provider process (step **506**, FIG. **24*d***) is performed for a home storage file. Since the user wants to restore the file to a folder on the gateway device **10**, the file manager **206** will move the file to a folder of the home storage in step **508**. The backup file (BF) is retrieved from the data center to the user's gateway device **10**. The status of the restore file detail is updated in step **510**.

[0169] In FIG. **24*c***, the restore file from backup service provider process (step **506**, FIG. **24*d***) is performed for a PC file. The file manager **206** will request that the PC Client manager ftp (file transfer protocol) the restored file from the HS to a folder of the PC or other endpoint device, which is performed in steps **512**, **514**. After the ftp to the PC folder is completed, the restored file on the home storage (OS) is deleted in step **518**, and the restore file detail is updated by the PC client in the backup service provider (step **516**) through the database interface.

[0170] FIG. **24*d*** depicts an exemplary process for restoring files from a backup service provider **96**. The file manager **206**

updates the backup file detail at the backup service provider **96** (step **520**) and requests the backup manager **200** to restore files (step **522**). The backup manager **206**: update the backup file detail (step **524**), connects the gateway device **10** to the backup service provider **526**, sftps a get file signal (step **528**), updates the backup file detail (step **530**), and inserts a restore file detail (step **532**). The retrieved backup file BF is uncompressed and decrypted to its original form (step **534**). The backup file is then deleted in step **536**.

[0171] The above processes have been described with respect to a backup service provider **96**. It should be understood that the processes are applicable to backups to a centralized storage location, or to distributed storage locations, such as other gateway devices external to the premises, as discussed earlier.

[0172] The gateway device **10** and its interactions with various endpoint devices and with the service management center **50** backup service provider have been described with reference to diagrams of methods, apparatus (systems) and computer program products. It will be understood that elements and functions illustrated in the diagrams, can be implemented by computer program instructions running on one or more appropriately configured hardware platforms, e.g. to operate as a gateway device **10** or as one or more systems implementing functions of the service management center **50**. Hence, operations described above may be carried out by execution of software, firmware, or microcode operating on a computer other programmable device of any type. Additionally, code for implementing such operations may comprise computer instruction in any form (e.g. source code, object code, interpreted code, etc.) stored in or carried by any computer or machine readable medium.

[0173] Program aspects of the technology may be thought of a "products," typically in the form of executable code and/or associated data for implementing desired functionality, which is carried on or embodied in a type of machine readable medium. In this way, computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, embedded processor or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, so as to implement functions described above.

[0174] Terms regarding computer or machine "readable medium" (or media) as used herein therefore relate to any storage medium and any physical or carrier wave transmission medium, which participates in providing instructions or code or data to a processor for execution or processing. Storage media include any or all of the memory of the gateway device or associated modules thereof or any of the hardware platforms as may be used in the service management center, such as various semiconductor memories, tape drives, disk drives and the like, which may provide storage at any time for the software programming. All or portions of the software may at times be communicated through the Internet or various other telecommunication networks. Such communications, for example, may enable loading of the software from one computer into another computer, for example, from the updater **51** a hardware platform for a gateway device **10** or from another source into an element of the service management center **50**. Thus, another type of media that may bear the software elements includes optical, electrical and electromagnetic waves, such as used across physical interfaces between local devices, through wired and optical landline networks and over various air-links. The physical elements that carry such waves, such as wired or wireless links, optical links or the like, also may be considered as media bearing the software. Hence, the broad class of media that may bear the instructions or data encompass many forms, including but not limited to, non-volatile storage media, volatile storage media as well as carrier wave and physical forms of transmission media.

[0175] While the foregoing has described what are considered to be the best mode and/or other examples, it is understood that various modifications may be made therein and that the subject matter disclosed herein may be implemented in various forms and examples, and that the teachings may be applied in numerous applications, only some of which have been described herein. It is intended by the following claims to claim any and all applications, modifications and variations that fall within the true scope of the present teachings.

1. A gateway device for operation at a user premises to provide and manage services of one or more endpoint devices associated with the gateway device, the gateway device comprising:

a first interface for enabling bi-directional network layer communications with one or more of the endpoint devices associated with the gateway device;

a second interface for enabling bi-directional network layer communications for the one or more endpoint devices via a wide area network, and for enabling at least some bi-directional communications with a service management center and at least one storage area external to the premises via the wide area network; and

a processor configured to manage backups and restores of the data between the one or more of the endpoint devices and the at least one storage area.

2. The gateway device of claim **1**, wherein the processor is further configured to receive data from the one or more endpoint devices that is at least one of encrypted and compressed and to transmit the received data to the at least one storage area.

3. The gateway device of claim **1**, wherein the processor is further configured: to receive data from the one or more endpoint devices that is at least one of unencrypted and uncompressed; to at least one of encrypt and compress the data from the one or more endpoint devices; and to transmit the at least one of encrypted and compressed data to the at least one storage area.

4. The gateway device of claim **1**, wherein the processor is further configured to receive the data from the one or more endpoint devices at a first time and to transmit the data at a second, later time.

5. The gateway device of claim **1**, wherein the processor is further configured to communicate with the service management center to receive a storage area access key.

6. The gateway device of claim **5**, wherein the processor is further configured to only transmit files to the at least one storage area with the storage area access key.

7. The gateway device of claim **1**, further comprising a local storage area that is inaccessible by the user at the user premises.

8. The gateway device of claim **7**, wherein the local storage area is configured to receive and store at least a portion of data to be backed up from other gateway devices via the wide area network.

9. The gateway device of claim **7**, wherein the at least one storage area external to the premises includes the local storage area that is inaccessible by the user at the user premises, and wherein backups and restores of the local storage area are performed at a storage area remote from the local storage area.

10. The gateway device of claim **1**, wherein the processor is further configured to interact with a backup service provider to request a restore of backed up data to an endpoint device from the at least one storage area.

11. The gateway device of claim **10**, wherein the processor is further configured to at least one of decrypt and decompressed files to be restored and to transmit the files to the at least one endpoint device.

12. The gateway device of claim **1**, wherein the processor is further configured to manage backups and restores of data, stored at the gateway device, between the gateway device and the at least one storage area.

13. A method of managing backups and restores of data from endpoint devices associated with a gateway device in a user premises to and from at least one storage area remote from the user premises, comprising the steps of providing data to be backed up from one or more endpoint devices to a gateway device comprising: a first interface for enabling bi-directional network layer communications with one or more of the endpoint devices associated with the gateway device; a second interface for enabling bi-directional network layer communications for the one or more endpoint devices via a wide area network, and for enabling at least some bi-directional communications with a service management center and at least one storage area external to the premises via the wide area network; and transferring the data to be backed up from the gateway device to at least one storage area remote from the premises.

14. The method of claim **13**, further comprising providing the gateway device with a storage access key, the gateway device transmitting the data to be backed up with the storage access key.

15. The method of claim **14**, further comprising transmitting the storage access key from the at least one storage area to the service management center, the service management center providing the gateway device with the storage access key.

16. The method of claim **13**, wherein the one or more endpoint devices at least one of encrypt and compress the data to be backed up prior to transferring the data to be backed up to the gateway device.

17. The method of claim **13**, wherein the gateway device receives the data to be backed up from the one or more endpoint devices and at least one of encrypts and compresses the data to be backed up prior to transferring the data to be backed up to the at least one storage area.

18. The method of claim **13**, wherein the gateway device transfers the data to be backed up at a defined time and frequency.

19. The method of claim **14**, further comprising the gateway device receiving the data to be backed up from the one or more endpoint devices at a first time, and transferring the data to be backed up to the at least one storage area at a second, later time.

20. The method of claim **13**, wherein the gateway device has a local storage area that is inaccessible to the user at the user premises and wherein the at least one storage area includes the inaccessible local storage areas of other gateway devices remote from the premises.

21. The method of claim **19**, wherein the transferring of the data to be backed up to the at least one storage area includes transferring different portions of the data to be backed up to different ones of the inaccessible local storage areas of the other gateway devices.

22. The method of claim **20**, further comprising recording at the gateway device usage of the at least one storage area.

23. The method of claim **20**, further comprising sending usage records from the gateway device to the service management center.

24. The method of claim **22**, further comprising preparing billing information for the user at the service management center based on the usage information.

25. The method of claim **13**, further comprising backing up data, stored on the gateway device, to the at least one storage area.

26. A gateway device for operations at a user premises to provide and manage services of one or more endpoint devices associated with the gateway device, the gateway device comprising:

a first interface for enabling bi-directional network layer communications with one or more of the endpoint devices associated with the gateway device;

a second interface for providing bi-directional network layer communications for the one or more endpoint devices via a wide area network, and for enabling at least some bi-directional communications with at least one storage area external to the premises via the wide area network; and

a processor responsive to control signals from a service management center received via the wide area network to provide and manage a backup and restore application service to manage backups and restores of endpoint user data of the endpoint user devices to and from the at least one storage area.

27. The gateway device of claim **26**, wherein the processor is further configured to receive the endpoint user data from the one or more endpoint devices that is at least one of encrypted and compressed and to transmit the received endpoint user data to the at least one storage area.

28. The gateway device of claim **26**, wherein the processor is further configured: to receive endpoint user data from the one or more endpoint devices that is at least one of unencrypted and uncompressed; to at least one of encrypt and compress the endpoint user data from the one or more endpoint devices; and to transmit the at least one of encrypted and compressed endpoint user data to the at least one storage area.

29. The gateway device of claim **26**, wherein the processor is further configured to receive the endpoint user data from the one or more endpoint devices at a first time and to transmit the endpoint user data at a second, later time.

30. The gateway device of claim **26**, wherein:

the second interface is further configured to enable bi-directional communications with the service management center external to the premises via the wide area network; and

the processor is further configured to receive information from the service management center configuring the processor to manage the backups and the restores of the endpoint user data between the one or more of the endpoint devices and the at least one storage area.

31. The gateway device of claim **30**, wherein the processor is further configured:

to communicate with the service management center to receive a storage area access key; and

to only transmit files to the at least one storage area with the storage area access key.

32. The gateway device of claim **26**, further comprising a local storage area that is inaccessible by the user at the user premises.

33. The gateway device of claim **32**, wherein the local storage area is configured to receive and store at least a portion of the endpoint user data to be backed up from other gateway devices via the wide area network.

34. A system for providing and managing services of one or more endpoint devices comprising:

a plurality of gateway devices at a plurality of respective user premises, each gateway device comprising a first interface for enabling bi-directional communications with one or more of the endpoint devices associated with the gateway device, a second interface for enabling bi-directional communications for the one or more endpoint devices via a wide area network, and for enabling at least some bi-directional communications with at least one storage area external to the user premises via the wide area network, and a processor configured to manage backups and restores of data between the one or more of the endpoint devices and the at least one storage area; and

a service management center external to each of the user premises and communicating with the plurality of gateway devices via the wide area network, the service management center controlling access by the plurality of gateway devices to the at least one storage area.

35. The system of claim **34**, further comprising an access key to the at least one storage area that must be received at the at least one storage area from the gateway device to cause the at least one storage area to store the data.

36. The system of claim **35**, wherein the service management center is configured to receive and maintain the access key from the at least one storage area and to selectively provide the access key to one or more of the plurality of gateway devices.

37. The system of claim **36**, wherein the service management center is configured to authenticate whether one of the plurality of gateway devices requesting a backup or restore is permitted to use a particular path for the backup or restore.

38. The system of claim **36**, wherein at least some of the gateway devices comprise a local storage area that is inaccessible by the user at the user premises.

39. The system of claim **38**, wherein the service management center is configured to manage the local storage areas of the at least some of the gateway devices as the at least one storage area.

40. The system of claim **39**, wherein the service management center is configured to cause the data to be backed up to be partitioned into separate portions and to distribute the separate portions to respective ones of the gateway devices to be stored on the local storage areas of those gateway devices.

41. The system of claim **40**, wherein the service management center is configured to cause the separate portions stored on the local storage areas of the respective ones of the gateway devices to be restored to one of the gateway devices when that gateway device requests a restore of the data and is authenticated for that restore.

42. The system of claim **41**, wherein the processor is further configured to backup data, stored on the gateway device, to the at least one storage area.

43. A computer readable medium bearing instructions that when operated on by a processor of a gateway device for operation at a user premises to provide and manage services of one or more endpoint devices associated with the gateway device, cause the processor to perform the steps of:

causing the gateway device to initiate a backup of scheduled and on demand backup of data of at least one of endpoint devices associated with the gateway device and data stored in the gateway device;

causing the gateway device to communicate with the endpoint devices associated with the gateway device to synchronize between the gateway device and the endpoint devices changes in data at the endpoint devices since a last backup; and

sending files to be backed up from the gateway device to at least one storage area remote from the user premises.

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